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ABSTRACT

Guidance in remedying/preventing deferred maintenance at colleges is provided, along with suggestions for action at the national and campus levels. The content is geared to recognize differences between the public and independent sectors, between institutions by size, mission and objectives, and regional influences on facilities. Information on estimated building replacement values is included. Approaches to selecting priorities for capital renewal and replacement are also covered, based on a systematic approach for policy decisions. The concept of grouping projects for cost effectiveness in the form of decision packages is introduced, along with a method for ranking priority levels of projects (i.e., necessary, suitable for reduction in scope and cost, or deferrable). In reviewing methods for establishing annual levels of funding, attention is briefly directed to existing formula methods, life cycle concepts, and replacement methods. Also outlined are techniques for institutional fiscal analysis of resources allocated to capital renewal and replacement requirements. Sources of funding for renewal/replacement (annual budgets, external sources, and innovative techniques) are discussed, and ways to build constituencies and formulate policy are suggested. (SW)

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Foreword

Two years ago AGB, in cooperation with the Association of Physical Plant Administrators (APPA) and the National Association of College and University Business Officers (NACUBO), published the FACILITIES AUDIT WORKBOOK. Our joint aim was to provide colleges and universities with a useful mechanism for determining and cataloging their deferred maintenance. This cooperative venture eventually led AGB, APPA, and NACUBO to pursue individual deferred maintenance projects particularly suited to each association's member institutions. Developed specifically for trustees and chief executive officers, CRUMBLING ACADEME will help direct your efforts toward remedying deferred maintenance and guide you in preventing its future occurrence.

As a trustee you are charged with the responsibility of protecting and preserving your institution's capital assets. Buildings, grounds, and equipment are your institution's most valuable possessions. For too many years campuses have deteriorated, and maintenance of these precious resources has been deferred. This critical problem could prove costly in years to come, if left unsolved. Even in this period of retrenchment, deferred maintenance cannot be allowed to escalate. Boards and their chief executive officers, working together, must find ways to fund capital renewal and replacement projects in order to safeguard campus facilities—higher education's largest investment.

Preparation of this publication was enhanced by the diligent efforts of Paul Knapp, Executive Director, APPA; D.F. Finn, Executive Vice President, NACUBO; and John W. Pocock, Chairman, Board of Trustees, College of Wooster and member of AGB Board of Directors. Author Harvey H. Kaiser has done the impossible by writing a helpful and informative book on the less than exciting subject of capital renewal and replacement.

Finally, we are indebted to IBM and AT&T for their continuous and generous support of both the FACILITIES AUDIT WORKBOOK and this volume.

Robert L. Gale
President, Association of Governing Boards of Universities and Colleges

Acknowledgements

The original idea for a book on capital renewal and replacement to guide higher-education policy makers came from the leadership of the Association of Governing Boards. Preparation of the manuscript and subsequent reviews were guided by Robert L. Gale, president; Nancy Axelrod, vice president for programs and public policy; and Roslyn Stewart Christian, director of special projects. Wayne Barrett, director of publications, applied a deft hand in editing that improved the final product.

The concepts and recommendations contained in this book do not spring from whole cloth. They are the outgrowth of cooperative efforts started several years ago by AGB, Association of Physical Plant Administrators (APPA), and National Association of College and University Business Officers (NACUBO), to call attention to capital renewal and replacement needs facing higher education. Paul Knapp, executive director of APPA was especially helpful in developing the concepts included in this book. His encouragement and suggestions over the years have enriched my understanding of bridging the gap between policy and reaching the people who make policy happen. The exchanges at workshops, by telephone, and mail are acknowledged to those many members of associations who shared their experiences and offered constructive advice on implementing proposals brought together here.

The concept for a national task force to examine capital renewal and replacement for higher education first emerged from NACUBO's Facilities Planning and Management Committee; however, the author assumes responsibility for the form in which it is presented in this book.

Publications by the associations were useful in developing the text and are important references for further reading. Of special note are:

COLLEGE AND UNIVERSITY BUSINESS ADMINISTRATION (NACUBO: 1982)

FINANCIAL RESPONSIBILITIES OF GOVERNING BOARDS (AGB)

FINANCIAL SELF ASSESSMENT-A WORKBOOK FOR COLLEGES (NACUBO)

Special thanks are owed to individuals who reviewed drafts of the manuscript and improved the organization and content of the final product. John W. Pocock helped enormously in sharpening the focus of the material and patiently commenting on the author's tedious rhetoric. His comments inspired the revisions with a firm view on the text's basic purposes. Richard Dober of

Richard Dober Associates generously lent ideas developed by his firm in their consulting experience. Alan C. Green of the Educational Facilities Laboratories shared his many years of experience in the higher education field. Ed Bogard of the Dallas County Community College District brought on-line knowledge of facilities management to play in the form of constructive criticism.

My special appreciation is due to Clifford L. Winters Jr., vice chancellor for administrative operations of Syracuse University. His leadership style inspired many of the concepts in this book and the confidence that higher education can succeed in the difficult tasks that lie ahead. Also, Louis Marcoccia, vice president and comptroller of Syracuse University, must be thanked for his help in explaining financial concepts and providing the opportunity for me to exchange ideas on renewal and replacement with NACUBO members.

The various stages of the manuscript were patiently prepared by Beth Hartzell and Laura Bartholomew. Their work was supervised by my secretary, Elizabeth Volan.

Preface

The halls of academe are crumbling. Buildings, grounds, and utilities of America's campuses of higher education are in a dilapidated condition, endangering life and property. The vitality of the higher education enterprise in this country is in jeopardy. The most heavily endowed campuses and those operating on a slim margin of tuition revenues and local government appropriations are not spared from the capital renewal and replacement dilemma.

These are the author's conclusions from visits and discussions with board members, administrators, faculty, and students at prestigious research universities, liberal arts colleges, and community colleges from coast to coast, border to border and in middle America. This view is shared by the associations of higher education at conferences, workshops, and in their publications; it is shared by those boards who have taken action or those beginning to sort out their priorities and funding problems.

The problem began to surface at a national level in the mid-1960s. The Ford Foundation sponsored Educational Facilities Laboratories, and the Carnegie Commission sounded early cautions about the future fiscal crisis, warning colleges and universities that avoiding maintenance on facilities represented a grave problem. But the problem remained largely ignored. Data gathered in 1974 by the Higher Education General Information Survey (HEGIS) confirmed the gravity of the situation, showing that 20 percent of the 3,200 colleges and universities facilities were in need of replacement.

The capital renewal and replacement dilemma for America's colleges and universities in 1982 is estimated at $40 to $50 billion dollars. This amount is based on a replacement value of $200 billion. Estimates of this magnitude can only be faced by new national policies for funding capital renewal and replacement at the federal, state, and local government level and by immediate action of governing boards and campus administrators.

This book is intended to provide guidance in formulating policy and suggestions for action at the national and campus level.

Several years ago AGB, APPA, and NACUBO joined forces to alert the higher education community to the crisis in facilities maintenance. An alarm was sounded with the provocative label of "a ticking time bomb." Earlier concerns identified the need to correct the deterioration of facilities resulting from deferral of maintenance. These were

broadened to address the overall needs of the renewal and replacement of higher education's physical plants. Rather than limit concerns to accrued deferred maintenance, the organizations have expanded efforts to examine needs for capital renewal and replacement of facilities and equipment.

In a series of publications, seminars, and testimony before state and federal legislative committees, AGB, NACUBO, and APPA presented the problems of deferred maintenance and capital renewal and replacement. To identify needs and find solutions for financing higher education's capital renewal needs, these organizations recognized that more must be done. A concentrated effort is necessary to:

- Assess the extent of the renewal and replacement backlog nationally;
- develop methods of inventorying campus conditions and selecting priorities;
- determine funding needs;
- evaluate available strategies for financing renewal and replacement projects; and
- propose policy recommendations for securing financial support of higher education's renewal and replacement needs.

Addressing a widely diverse audience courts the risk of generalizing issues and providing superficial treatment of techniques and recommendations in dealing with thousands of campuses and costs that exceed all the endowments of higher education. But the observant trustee and campus administrator who know that capital renewal and replacement jeopardizes their stewardship must take action. So do the faculty, researchers, staff, and students who must cope with dilapidated buildings, rundown grounds, and obsolete equipment. Not to be ignored are the parents who will reject a seedy-looking campus for one that is attractive and well maintained.

To meet the need for action, the book offers recommendations to secure the attention of policy makers at the national level; simultaneously, suggestions are made for administrators and governing boards at the local campus level. Content is geared to recognize differences between the public and independent sector, between institutions by size, mission and objectives, and regional influences on facilities.

Audiences at conferences and workshops on the capital renewal and replacement dilemma repeatedly raise three issues: How do we select priorities among the many needs we are facing? How much funding is appropriate to satisfy the needs? And where are the funds coming from? This book was

conceived to answer these questions for the higher education community campus administrators, governing boards, legislators, and the general public. It is designed to serve as a guide for solving the capital renewal and replacement dilemma.[1]

Chapter Two discusses the need for selecting priorities for capital renewal and replacement. Campus administrators, all too familiar with an array of projects requiring funding, are offered guidelines for selecting priorities. Projects identified by an inventory based on the author's FACILITIES AUDIT WORKBOOK, (published jointly by AGB, NACUBO, and APPA: Washington, 1982) are summarized for reference purposes.

Opportunities to gain maximum effectiveness from expenditures are treated by introducing the concept of grouping projects for cost effectiveness in the form of decision packages. A method for ranking priority levels is presented by defining projects that are: (1) necessary, (2) suitable for reduction in scope and cost, or (3) deferrable. Also discussed is the difficult question facing campus administrators and governing boards of renewing or replacing existing facilities, and levels of renewal. The material covered in this chapter is aimed at providing a systematic basis for policy decision.

Chapter Three and Chapter Four address the always vital issues of funding capital renewal and replacement and are intended for application to the individual campus.

In Chapter Three, methods for establishing annual levels of funding are explained, including an overview of existing formula methods, life cycle concepts, and replacement methods. Also outlined are techniques for institutional fiscal analysis of resources allocated to capital renewal and replacement requirements.

Chapter Four discusses sources of funding for capital renewal and replacement. No magic is offered here; however, three sources—annual operating budgets, external sources, and innovative techniques—are examined to suggest opportunities for generating funds. Attention is drawn to the need to sort out strategies for different types and control of higher education institutions. The obvious similarities and differences in strategies for the public and independent sectors and regard for size, mission, and objectives of institutions are emphasized.

Chapter Five summarizes recommended actions. Suggestions are offered for building constituencies and policy recommenda-

tions to secure the needed financial support of higher education's capital renewal and replacement needs.

Admittedly, each chapter represents potential volumes of study. There are the pitfalls of giving too broad a treatment for some of the audiences, especially the financing strategies and recommendations for public policy, and not providing enough detail for others. In trying to reach a broad audience more questions may be raised than answered.

We cannot be certain that capital renewal and replacement will immediately secure necessary funds among the competing demands for scarce resources in higher education. Because further deterioration to buildings, grounds, and utilities can disrupt academic, research, and public service activities, immediate action is recommended.

A beginning on the subject is necessary. If capital renewal and replacement becomes a top agenda item at board meetings and administrators' conferences, then the goals of this book will be achieved.

[1] A bibliography is provided with references for readers with an interest in more detailed treatments of chapter contents. Two sources offering guidance for immediate action by governing boards and campus administrators are: FINANCIAL RESPONSIBILITIES OF GOVERNING BOARDS (published by AGB; 1979) and FACILITIES AUDIT WORKBOOK (published jointly by AGB, NACUBO, and APPA; 1982)

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CHAPTER ONE

Issues

Much has been offered as advice to higher education about managing resources effectively. The alarm was sounded by the Educational Facilities Laboratory and the Carnegie Commission over a decade ago. The echo has been repeated by countless books, articles, symposia, and speeches. And with good reason. The crest of higher education's wave of expansion in the 1950s and '60s left in its wake a cloudy financial condition, one obscured by a declining pool of students, the troubled national economy, institutional costs rising faster than revenues, and uncertain government support.

The gloomy forecasts of future financial crises are being verified on campuses nationwide. Financially strong institutions are making major sacrifices to maintain the quality of academic programs; weaker institutions and public systems are now in the throes of reducing staff, deferring compensation, and eliminating programs. As a result, maintenance is deferred, renewal and replacement of academic, residential, and support buildings ignored, and purchases for replacement of technologically obsolete equipment postponed.

In the current climate of fiscal constraints, resources for capital renewal and replacement are being allocated to preserve the academic enterprise. Meanwhile, the capital assets of higher education are being severely threatened.

How Did the Capital Renewal and Replacement Dilemma Occur?

The impact of plant expansion to meet rapidly expanding post-World War II enrollments compounded financial difficulties of

higher education, as foretold in 1970 by Jenney and Wynn:[1]

> ...plant expansion has produced a major future and probably accelerating escalation for plant maintenance, repairs and replacement; this has been built into the system for years to come, and we find scant evidence.... that this expense problem is being anticipated.

After a generation of students moved through the buildings and used the equipment, how have the facilities of higher education fared? Not very well is the answer. The act of faith that plant replacement would occur through government largesse, or from private gifts and grants, has proven to be a myth. After many years of neglect, plant improvement and equipment replacement are rapidly becoming issues in higher education. TIME Magazine recently heralded the case as "Dilapidation in Academe," describing buildings and machinery falling apart due to neglect and shrinking maintenance budgets.[2]

Part of the problem is due to the age of higher education's physical plant: 25 percent was built before World War II; a similar amount was added to the campus space inventories by 1960. Another component of the problem is that the large volume of construction in the 1950s and '60s typically was built at the lowest possible costs and with new building materials and systems. The result was a surge of construction with little concern for future maintenance, long-term quality, or energy conservation.

In the post-World War II higher education construction boom older facilities were neglected. It was easier to find money for new buildings. While ribbons were cut for new classrooms, laboratories and residence halls, older buildings and equipment were deteriorating, becoming obsolete, and accruing deferred maintenance. The last comprehensive national survey of higher education facilities (National Center for Education Statistics in 1974) reported that of more than 2 billion square feet of space, 19.3 percent was in need of remodeling, demolition, or termination. For the remodeling alone, costs were estimated at $2.3 billion (in 1973 dollars).

Indications were that by 1982 facility conditions had worsened. Budget reductions to offset gaps between income and expenditures inflicted a severe toll on the academic enterprise, including personnel compensation and academic programs. The most severely reduced expenditures were those needed for repair and replacement of buildings and equipment.

Several factors reduced plant operations and maintenance allocations available for repair and replacement. The energy crisis required investments in conservation to correct waste from buildings designed and built when energy sources were plentiful and cheap. The sad commentary is that major capital outlays to reduce consumption have not resulted in actual dollar savings, but served only to offset utility rate increases. Inflation has outpaced higher education's ability to respond to increased expenditures, while corresponding increases in revenues and efforts to offset the gap between costs of education and family incomes required diversion of resources to meet student financial aid. Aggravating the unexpected rise in energy costs and inflation were government laws and regulations concerned with social security, environ-

mental quality, handicapped access, and occupational health and safety. The result has been unexpected capital outlays and the reallocation of operating budgets to address these needs.

Overshadowing the shortfalls in funding plant renewal and replacement is the obsolescence of equipment. Scientific advances and new research techniques require improved equipment and instrumentation.

Technological advances make otherwise well functioning laboratories and equipment obsolete. A recent study by the Association of American Universities reported that equipment in the nation's leading research universities is twice as old as that used in prominent industrial research laboratories. Much of the equipment purchased through government contracts and grants in the 1950s and '60s has reached the end of its useful life and now should be replaced.

During the expansion of 10 to 20 years ago, financing for plant and equipment was readily available. Grants and long-term, low-interest loans from federal and state governments, private gifts, and foundation support were relatively easy to come by. The situation is drastically different today. Federal programs that financed initial construction and acquisition of equipment have been eliminated or greatly reduced. From a level of $1.1 billion in 1967, total federal government facility funding fell to $144 million in 1978, an 87 percent reduction without considering the effects of inflation. Federal research and development plant support for higher education dropped from a peak level of $126 million in 1965 to $22 million (constant dollars) in 1981. Similar patterns have occurred for facility support from state governments.

Another burden: the attitudes of foundations and private donors who committed funds to new construction but who are not as willing to contribute for renovation projects. The problem is compounded by the loss of access to debt financing, a customary source of funding, discouraged by high interest even at tax-exempt rates. Less than half the states have public authorities through which independent higher education institutions may issue tax-exempt bonds. Many of them require fully collaterization of debt by unrestricted endowment, a requirement many institutions cannot meet. Only modestly increasing private giving offers a bright spot in the picture.

How Much is Needed for Repair and Replacement?

The capital renewal and replacement dilemma has three dimensions:

- The total area and age of physical plants
- The replacement value of plant
- Repair and replacement funding needs

One indication of the size of this problem is the age of campus buildings. Almost a quarter of the space now in use was built before 1950; another 25 percent added between 1950 and 1965. Since 1974, when it was estimated that 20 percent of space needed major remodeling or replacement, it can be assumed that this proportion has increased as plant and operations funding declined. Because buildings do not deteriorate at a constant rate in agreement with standard depreciation tables (systems and components require replacement over varying periods), and renovations are not reflected in the age of a building, replacement needs vary. Another indicator of the size of this problem is the area of campus space. The currently estimated 2.3 billion

square feet of college and university space has increased dramatically in a relatively short period of time: All the space built before 1950 doubled by 1965, then doubled again by 1981. The dominance of independent institutions has reversed after 1950 with the rapid expansion of space for public higher education, now four times the area of the private sector.

The space distribution between independent and public sectors has a troublesome aspect. Independent institutions are familiar with fund raising from various sources. They can shift their focus with flexibility, offering optimism for funding capital renewal and replacement in this sector. Prospects are not so promising for public institutions that traditionally have to present their case before state legislatures, and lack experience in seeking private support. While public policy to support capital renewal and replacement is important for both sectors, public institutions will have to play an expanded role in influencing federal and state policy.

Important in shaping national policy making is the pressing need to update information on the physical assets of higher education. The last comprehensive national survey was compiled by the National Center for Education Statistics (NCES) in 1974. Only limited information is available for the value of land, buildings, and equipment through 1981.[3] The lack of data for an accurate assessment of the current condition of higher education's physical plant illustrates the need for a new national survey to assist policymakers.

However, the trustee or campus administrator does not need a national survey to tell them that their campus needs capital renewal and replacement. They can see and hear it firsthand from faculty, staff, and students. The focus at the campus level is to measure needs by an inventory of buildings, grounds, and utilities; select priorities, and seek the required funding.

Measuring the amount of funding needed for capital renewal and replacement serves two purposes: providing gross estimates of overall higher education as a guide to public policy making, and the estimating of individual campus needs.

At the national level, the 1981 total replacement value of higher education's physical plant was around $200 billion, with replacement value of $143 billion for buildings and almost $60 billion for grounds and equipment. Estimates of the total higher education need for capital renewal and replacement can be achieved by projecting data from the 1974 HEGIS survey of over 3,000 campuses. That survey showed 80 percent of all space in satisfactory condition. Ten percent required remodeling at costs up to 50 percent of replacement value (Remodeling Categories A and B). Another ten percent required remodeling for costs exceeding 50 percent of replacement value, demolition or termination (Remodeling C).

Projected for 1981 costs, the first category (Remodeling A and B) would require $14.3 billion for funding building renewal and replacement; the second category adds another $14.3 billion for a total of almost $30 billion. Replacement costs for grounds and equipment estimated at approximately $10 billion produce a total capital renewal and replacement of $40 billion. These costs suggest the major scope of capital renewal and replacement needs at the national level and the magnitude of the problem facing policy makers.

Use of this gross data for estimating campus capital renewal and replacements provides illustrations of needs at "average" universities, four-year colleges, and two-year colleges. Table 1-1 shows building replacement values by level of institution, age, and condition of buildings. The combined renewal and replacement needs for an "average" university is estimated at $70.4 million, $6.3 million for a four-year college, and $1.69 million for a two-year college. These costs may seem high at first glance, but institutions that have made comprehensive surveys of their capital renewal and replacement needs have come up with estimates that approach these staggering amounts.

Other guidelines may be useful in understanding needs at the campus level. A 1981 survey of deferred maintenance by the Association of Physical Plant Administrators (APPA) of 226 institutions with 454 million gross square feet showed that an estimated $1.85 to $2 per gross square foot was required to eliminate the most pressing needs. Applying the $2 per gross square foot to the examples of average institutions in Table 1-1 would result in a deferred maintenance need of $9.5 million for a university, $1.1 million for a four-year college, and $0.4 million for a two-year college. These amounts do not cover the full amount of capital renewal and replacement but provide an indication of the funding needs to governing boards and campus administrators.

There is a huge investment in the physical plant of higher education, one that must be

TABLE 1-1 ESTIMATES OF CAPITAL RENEWAL AND REPLACEMENT

Level:	University	4-Yr College	2-Yr College
Bldg Replacement Value	$352,000,000	$42,260,000	$15,310,000
Gross Sq. Ft. Area	4,760,000	584,000	214,000
Age (percent of total)			
to 1950	36.2	28.6	17.3
1951-65	34.5	34.5	25.4
1966-74	29.0	36.6	56.9
Condition (percent of total)[1]			
(1) Satisfactory	80	85	89
(2) Remodeling A	10	10	6
(3) Remodeling B	10	5	5
Need[2] (000,000s)			
(1) Remodeling A	$35.2	$4.2	$0.92
(2) Remodeling B	$35.2	$2.1	$0.77

Source: National Center for Statistics, INVENTORY OF FACILITIES IN INSTITUTIONS OF HIGHER EDUCATION, FALL 1974

NOTES:

1. Conditions are HEGIS categories of: (1) Satisfactory; (2) Remodeling A = Cost of remodeling is greater than 25% but not greater than 50% of replacement value; and (3) Remodeling B = Cost of remodeling is greater than 50% of replacement cost, demolition, or termination.

protected and used wisely. Unfortunately, it is being ignored. The amount of funding required for capital renewal and replacement may be discouraging, but campuses forestalling action will pay a severe penalty. The continued deferral of maintenance will be paid several times over in the future when what was once a bill for minor repairs becomes a major expense item.

That wise old investor, showman Billy Rose, once said, "never put your money in anything that eats or needs painting." It is a principle colleges and universities would like to follow—but cannot afford.

Repair and replacement needs vary by region, building type, the extent of use and abuse, and quality of original construction and maintenance. But, as sure as death and taxes, building systems and components deteriorate and need replacement. Plumbing wears out, roofing leaks, window frames warp, patched-up electrical wiring becomes dangerous, heating systems fail to heat, and equipment parts can no longer be replaced. These are glamorless priorities, especially when reductions in staff and quality of academic programs are at risk.

Such issues must concern governing boards and administrators responsible for the stewardship of their institutions. They are, by nature, matters that fall within the purview of ordinary management—management, that is, as opposed to mere administration. For management, properly defined, is the fullest exploitation of resources to attract their greatest yield.[4]

In the next chapter, we will address the first step in managing for performance, the selection of renewal and replacement priorities.

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[1] Jenny, Hans and Wynn, G. Richard. THE GOLDEN YEARS. Wooster, Ohio: The College of Wooster, 1970.

[2] TIME, March 17, 1980.

[3] Sources: U.S. Department of Health Education and Welfare, National Center for Statistics Financial Statistics of Institutions of Higher Education.

[4] Educational Facilities Laboratories. CAMPUS IN TRANSITION. New York-Educational Facilities Laboratories, 1975.

CHAPTER TWO

Priority Selection

The question facing governing boards and the campus community is not whether we have a capital renewal and replacement problem but—how serious is it? Determining the size and cost of the problem requires an inventory of conditions—a facilities audit—and guidelines for setting project selection criteria. This chapter addresses these two issues by describing the inventory process and offers guidelines for selecting renewal and replacement projects.

The concern of the governing board and senior administrators about facility conditions could create the following scenario: Laid out in front of a chief business officer is a list of several dozen projects for capital renewal and replacement. Anxiously waiting for a rigorous set of questions is the facilities manager. He has spent weeks collecting the input of his staff and compiling comments from academicians and auxiliary managers in order to refine the list of projects totalling millions of dollars. Consultants, contractors, and equipment suppliers have assisted by providing the cost estimates to complete the work.

The business officer scans the list, the computer printouts, and a loose-leaf binder crammed with supporting documentation. The business officer thinks for a moment, and then asks a stream of questions:

"Are these organized by priority?"

"What guidelines did you use for ranking the projects?"

"Is the list free of projects we can categorize as capital construction or routine maintenance and thus absorb in the expenditure and general expenditure budget?"

"Could the projects be grouped as buildings, grounds, or utilities?"

"Have you looked at the benefits of grouping different projects for one building into a single package?"

"Is escalation of costs included in projects that may have to be se-

quenced for future years?"
"Have projects that are deferrable or can be reduced in scope or cost been identified?"
"Are any of the projects targeted for facilities we want to replace?"

It is unlikely that many facilities managers could answer all of these questions; some could be answered satisfactorily, others not at all. The prepared facilities manager recognizes the task of selecting projects for capital renewal and replacement as a process that operates within a set of guidelines composed jointly of a criteria for priority selection and definition of funding category. The process and guidelines for priority selection are interwoven. As the technical tasks of auditing facilities move forward to identify capital renewal and replacement needs, comparisons must be made continually with the selection criteria and funding definitions. Completion of the technical tasks without reference to a set of guidelines leaves many of our business officer's questions unanswered.

Cost effectiveness for capital renewal and replacement requires integration with a comprehensive facilities and equipment renewal program. The limited resources available for capital renewal and replacement are subject to financial constraints and necessitates establishing priorities.

Factors Affecting Priorities

Selection of capital renewal and replacement priorities is similar to general resource allocation in higher education. The process requires: (1) a determination of needs and resource availability, followed by (2) selection of priorities and, finally, (3) allocation of available resources. Although the process appears simple, it is subject to confusion with decisions on suitable levels of funding.

Suggested strategies and policies of resource allocation for capital renewal and replacement have evolved from investigations in formula funding[1] and recommendations for revised accounting procedures[2, 3] to reflect building deterioration. However, these strategies are ancillary to the central process of institutional resource allocation. They serve well in calling attention to appropriate levels of funding capital renewal and replacement, but do not replace the priority selection process.

The selection of priorities is based on needs identified by a systematic inventory of existing conditions: the facilities audit, an objective procedure with a technical orientation. Added to the technical activities of inventorying are intangible factors. Higher education does not operate in a value-free environment but is affected by other factors —the influence of donors, the views of distinguished campus academicians, the personal prerogatives of senior administrators, the impact of community sentiment. Whether to save or tear down "Old Main", an argument visited on many campuses, reflects the compromises made between technical evaluations and other values. The process of selecting projects for capital renewal and replacement is subject to a tortuous path of debate, similar to the compromises made in the formulation of annual operating budgets or campaigns for capital funding.

Facilities Audit

The facilities audit is the starting point for selecting capital renewal and replacement priorities. It examines the conditions of

FIGURE 2.1 THE SELF-EVALUATION PROCESS

PHASE ONE—DESIGNING THE AUDIT

STEP I—Determine the Scope of the Audit

A. What to include
   1. Buildings
   2. Grounds
   3. Utilities
B. Depth of Audit
   1. Need
   2. Cost
   3. Time
C. Phases
   1. Comprehensive Audit
   2. Condensed Audit

STEP II—Select Team

A. Prime Responsibility
B. Members
   1. Institution
   2. Consultants

PHASE TWO—COLLECTING THE DATA

STEP III—Design a Plan of Attack

A. What information to collect
B. Who will collect information
C. Schedule

STEP IV—Collect the Data

A. Buildings
   1. Physical Data
      a. Primary systems
      b. Secondary systems
      c. Service systems
      d. Safety standards
   2. Functional Data
B. Grounds
C. Utilities

STEP V—Analyze and Evaluate Data

A. Physical Evaluation
B. Functional Evaluation
C. Priority repairs and renovations
D. Maintenance Needs
E. Cost Estimates

PHASE THREE—PRESENTING THE FINDINGS

STEP VI—Summarize

A. Building characteristics
B. Building evaluation summary

STEP VII—Prioritize

A. Repair and renovation projects
B. Five-year program

STEP VIII—Report/Present

A. Define audience
B. Identify data required
C. Design presentation

buildings, grounds, and utilities plus their functional appropriateness. The audit evaluates the physical condition and functional adequacy of campus facilities, produces a record of building's characteristics and use, existing condition, an overall facility rating, and comments on maintenance requirements and repair and renovation needs. The process is divided into three phases that, in turn, subdivide into a series of steps (See Figure 2.1) There can be many variations on this framework, depending on an institution's size, existing data, and resources.

Data collection, the second phase of a facilities audit, contains three basic elements: (1) designing a plan of attack, (2) collecting the data on building conditions; and (3) evaluating and analyzing the data. At the completion of the audit, a cost analysis is calculated for each building to determine estimated replacement value on a square-foot and total-cost basis, factoring in repair and replacement costs of priority projects. (See Appendices A and B for summaries of: Facilities Audit and Cost Estimates for Replacement Values.)

When a facilities audit for a campus has been completed, and replacement values for each building type have been determined, order-of-magnitude costs can be developed for capital renewal and replacement needs of all campus facilities. Projections can be readily updated for inflation or changes in building conditions, and as the basis for initial efforts to estimate capital renewal and replacement costs. In developing five- or ten-year renewal and replacement programs, the audit results can aid in decisions to renovate or replace a building, selection of project priorities, and scheduling of improvements. By updating the audit annually and noting new deficiencies or improvements, requirements for renewal and replacement costs are readily available.

Projects identified by the facilities audit fall into three general categories. The first and most obvious are of the deferred maintenance variety—those projects not funded in normal budgetary cycles and/or postponed for future funding. As these unfunded projects accumulate, they begin to endanger the integrity of structural and mechanical systems; damage to the exterior building envelope permits weather penetration.

The second category, overlapping deferred maintenance, includes projects for retrofitting buildings to improve energy conservation, providing access for the physically handicapped, eliminating health and safety hazards or building code violations, and making environmentally desirable renovations. In the third category, created by technological obsolescence that causes functional changes in structurally sound facilities, alterations are required in order to adapt space to changing academic programs and to accommodate equipment replacements.

The facilities audit approach has one major limitation: it only describes and evaluates present physical and functional factors. Institutions which use this approach should consider qualitative factors such as a building's historical value or future possibilities. The facility rating system does not set priorities; rather judgments must be made which require an overview of a building, utility system, or grounds, and should not be limited to individual project priorities.

Decision packages combine projects for the most economic organization possible rather than selecting projects in a single facility by

strict ranking of priority. This approach recognizes that facilities are collections of systems and not individual components. For example, a high priority for roof repairs should not ignore combining a lower priority for another part of the same building. The possibility of combining work on several systems that share construction sequences, such as scaffolding, can be more economical by combining less significant priorities into larger projects.

Fiscal constraints on funding usually provide little latitude in reaching further down into priority lists to bypass higher priority projects. However, economies resulting from incorporating projects into decision packages comprised of several different levels of priority cannot be overlooked. It is possible to cut across several priority levels, combining life-safety work and cost-effective measures with mission-support projects. Thus, a high priority of safety measures in a laboratory can be combined with lower priority improvements to mechanical systems, lighting, interior finishes, or replacement of laboratory equipment.

The decision-makers involved in this process must have confidence in the technical evaluations produced by the facilities audit; and the audit must be supported by evidence that goals are being achieved systematically in an efficient, orderly fashion. Furthermore, there is no entirely objective method of selecting capital renewal and replacement priorities in a central budgeting process. Decisions must be reached by compromise between competing demands.

Renewal Versus Replacement

As institutions place moratoriums on new construction and seek to accommodate existing or new programs in obsolete facilities, the difficult question of renewal versus replacement arises. The problem is reasonably simple when a building scheduled for renewal is not in a central campus location or not an object of nostalgia for alumni, but becomes complex when a building has historical and architectural value and contributes to the continuity of an institution.

The current dilemma of renewal and replacement of large numbers of campus buildings comes at a time of financial stringency. Secondly, higher education is dynamic, thus capital construction and major renovations will continue.

The academic enterprise is continually in flux as new programs are created to respond to social and technological change, and existing programs are consolidated or replaced. The need to accommodate academic change is complicated by the serious backlog of deferred maintenance and building deterioration.

Since financial constraints are expected to continue, some decisions to "renew or replace" must be supported and some deferred. Those proposals most worthy of support must contain compelling reasons: hazardous conditions, legal requirements, the need to maintain accreditation, or protection of buildings. Proposals deferred as not vital for immediate attention entail the risk that the building condition may worsen, creating greater future liabilities. The decision to defer should be reached only after determining priorities and selecting those projects requiring early attention.

Renewal or replacement of existing facilities focuses on the basic question of whether a proposed project is worth undertaking. To

answer this question the governing board and campus administrators will have to thoroughly examine the programmatic needs of the institution as well as the feasibility of the project. The condition hinges on whether a renovated structure will satisfy academic requirements for the building for a projected additional life of 50 to 75 years.

One element in the decision to renew or replace is campus and community attitudes toward a structure. Other considerations include the cost of renovation and the problem of loss of space during construction. Among questions to be asked are: What levels of renovation are possible? Can work be phased to allow use during renovation? Can equivalent funds be spent more wisely to rehabilitate other space? And, finally, can proposed academic and other institutional needs be better accommodated with complete replacement of the existing building? In some cases one must weigh the advantages of renewing an existing structure, even at premium costs.

Apart from the question of historic, architectural, or sentimental value, the renewal or replacement decision involves a host of practical considerations: Can the older building really be saved by renewal? Can financial support be attracted for a renewal rather than a replacement? Will the results of building renewal be functionally and esthetically successful?

In recent years, many colleges and universities have reevaluated their older structures for purposes of historic preservation. Examples of successfully retaining a building's original exterior while completely replacing its interior can be found at Harvard, Stanford, Cornell, and Syracuse Universities, and other private and public campuses. Unfortunately, there are also examples of ill-conceived attempts to retain the character of an original facade and of reusing parts of a building in a new structure.

To avoid hasty decisions each building should be evaluated individually, without preconceived solutions. A thorough appraisal of costs and benefits is necessary before embarking on a renewal project. Special care should be taken for a building that represents an example of a certain architectural style or construction technique, that is representative of a distinguished architect, that is in harmony with adjacent buildings, or that has a unique design with pleasing proportions.

The last category demands special care. There are periods in the life of a building when its design is no longer fashionable; but sometime later there is a renewed appreciation of its beauty. Victorian architecture is an example of a style that, after a long period of neglect, is now gaining appreciation for its robust forms, warmth of materials, and ornate decoration.

In judging a proposal for replacement of a building, consider the potential advantages:

- Does it help provide a visual history of the institution and a continuity of the past?
- Does it contribute to a sense of performance?
- Is there a harmony with adjacent buildings, providing a design unity for the campus?
- Will it attract continued support from the donors of the original building, and will its preservation help attract other donors?

Disadvantages must also be considered:

- Interior spaces, equipment, or teaching

methods of a previous era may not readily accommodate present and future requirements.

- The upgrading of older buildings with new mechanical and electrical systems, however necessary, provides little visible improvement. This drawback may induce additional modifications not necessarily warranted for intended functional improvements.
- The building being considered for renewal may actually have no redeeming features other than its age, and should be demolished or substantially altered.

Costs of new facilities in 1982 ranged from $60 per square foot for general purpose academic and administrative buildings to over $100 per square foot for sophisticated laboratory facilities. Renewal costs vary, depending on the selected alternative scope of work and existing building conditions. The most important variables are labor and material costs in the local area.

In a 1952 article titled "Modernizing School Buildings," Henry Linn set 40 percent of the cost of new construction as a realistic limit for modernization. Reviewing the changes in construction costs in 1981, the Ohio State University planning office concluded that if modernization costs were less than 65 percent of replacement construction, it merited consideration.

Assumptions about the relationship between renewal and replacement costs are risky, considering the investments involved. A detailed feasibility study is necessary before making a final decision. Reassessments of buildings either abandoned or consigned to demolition have often led to choices of renewal rather than replacement.

A guide for the feasibility of renewal is suggested by the value of a building's components. The skeleton and exterior envelope represents 33 to 40 percent of its value; interior construction 20 to 25 percent; and mechanical plumbing, and electrical systems 35 to 40 percent. Depending on their condition, portions of a building may be reusable. Thus, each component should be carefully evaluated for cost of its reuse in comparison to new construction.

Comparing the cost of new construction to the value of the components of an existing structure provides guidance in reaching a final decision for renewal or replacement. The total replacement of a 50,000-square-foot building at $80 per square foot would cost $4 million; reuse of the existing structure and exterior envelope could represent 40 percent of the cost, or $1.6 million. Reuse of the mechanical and electrical systems could save $1.6 million of the replacement building's costs, and so on. By this method, each building component can be assessed to determine its value as an offset to new construction. An important factor in the analysis is the functional appropriateness of the end result.

In 1964, on the eve of the great growth period for higher education, the Educational Facilities Laboratories offered advice on renewal and replacement that stands today:[4]

> "...colleges would do well to look twice at their old buildings before deciding to tear them down. To spare the wrecker's axe may be to spare the budget. A good rule of thumb may be to renovate if the building is where it belongs, is structurally sound, and possesses beauty, however ancient. If the

building is in the wrong place, if its interiors are practically unchangeable, if it is ugly, abandon it."

Priority Selection Guidelines

Selecting priorities for capital renewal and replacement faces similar temptations that occur in developing annual operating budgets. Established in a political environment of satisfying competing short-term needs, in contrast with long-term institutional goals, the annual operating budget becomes a compromise between alternatives. Overcoming this traditional approach to distribution of resources requires clear policy guidelines in selecting priority projects for capital renewal and replacement.

Several schemes for priority project selection developed by public systems of higher education and independent institutions rank various categories, ranging from three broad categories up to a dozen different project descriptions. The schemes have been devised as guidelines for isolating key factors in funding requests by urgency of need.

In recommendations to the State of Mississippi Board of Trustees, Richard P. Dober and Associates categorize funding requests by compelling need and calculated risk:

> "Compelling need projects were those requests which deserved support because they involved eliminating physical conditions that were hazardous or counter to public safety; or were necessary to institutional accreditation; or complied with court orders; or were cost effective because they would remove or improve certain physical conditions and produce significant economic benefits. Calculated risk projects were submissions which might be deferred—not because they were deemed unnecessary but because the case for other projects was more compelling."

This basic concept of compelling need and calculated risk was then divided into twelve categories of priority:

1. Hazardous Conditions
2. Life Safety Actions
3. Accreditation Requirements
4. Legal Compliance
5. Immediate Cost Containment
6. Energy Conservation
7. Historic Preservation
8. Project Completion
9. Mission Support
10. Institutional Advancement
11. Deferred Maintenance
12. Anticipating Actions

All of the surveyed schemes incorporate similar elements. The basic rationale described by L. Terry Suber of Colorado State University brings these elements together as a system for prioritizing capital renewal and replacement projects:

> "...to protect the occupants first, buildings second, built-in equipment third, and other facilities fourth. Then each of these conditions can be divided into several categories."

Flexibility is imperative in translating these schemes into a set of priority categories for a statewide system or individual institution. Boards and their chief executive officers must be mindful that the cost of energy will continue to rise, governmental mandates will emerge anew, and existing buildings will age. If left untended, faculty, students,

and administrators will recognize the deterioration of the campus physical environment.

Priority Selection: Decision Packages

Priority selection of capital renewal and replacement projects is a sorting process—one that begins with the facilities audit and ends with a recommended list of projects. It is a process of sorting projects with constant reference to guidelines for selection and funding categories, initially separating projects with potential as capital construction—new buildings or major additions funded outside the operating budget—or projects more appropriately incorporated in plant operations of the annual operating budget.

Capital construction projects are usually self-defined by program scope, complexity, and magnitude for cost of new structures or major additions, as opposed to renovations of existing structure or utilities. Classifying a project as capital construction is usually determined by costs; but setting lower limits, say of $10,000 to $100,000, should be based on an institution's budgeting history and practices of funding facility improvements.

In a similar manner, projects classified for funding from education and general expenditures in the annual operating budget can be guided by cost, scope, and budgeting practices. For example, repairs to parts of a heating system are less complex and expensive than replacement of an entire building's mechanical system.

Richard Dober has defined several factors influencing the assignment of priorities as capital renewal and replacement projects. Functional factors include institutional liability proposals, economy and efficiency measures, and projects to meet program and operational purposes. Added to these are intangible factors introduced as subjective reasons for priority selection. Although these considerations may seem obvious to higher education administrators and policy makers, the following are possible pitfalls and misconceptions.

1. **Institutional Liability Proposals.** Special matters requiring early attention because, if the problems are not remedied, people may be injured, property damaged, and the institution's physical ability to fulfill its missions placed in jeopardy, possibly through legal suits, injunctions, and court-ordered actions.

2. **Economy and Efficiency Measures.** Physical plant actions that support program and operational objectives, but deserve special attention because they will also result in immediate or eventual cost savings.

3. **Program and Operational Purposes.** Actions necessary to support institutional missions because they produce space, furnishings, equipment, utilities, and other physical items the campus must have to conduct its activities.

4. **Intangible Factors.** Because there are always "borderline" decisions in applying funding priorities, especially when the likely funds available fall short of probable needs, differing opinions will emerge. For example, does one defer action on eliminating hazardous conditions or achieving operational economies in favor of projects for program advancement in an academic or research area?

Evaluating these factors involves taking calculated risks, some more dangerous and counterproductive than others. Risks include not only potential bodily injury, damage to existing physical resources, or fiscal instability by postponing deferred maintenance or avoiding energy conservation measures, but also the risk of erosion in program quality and campus life. These are less tangible but as debilitating as the more obvious consequences of deferring high priority building and site repairs.

In developing a system of priority selection the various factors are sorted into three categories, as follows:

Necessary Projects. Hazardous conditions to life and safety; accreditation requirements; legal compliance with local, state or federal regulations; immediate repairs to prevent a loss of service; and energy conservation with a short-term payback period.

Deferrable Projects. Repairs, renovations, and related physical plant improvements less urgent than necessary projects; support of academic programs and other research and community service requisites for carrying out the institution's educational missions; and actions anticipating long-range institutional development, e.g., land acquisition, road or utility expansions, and advance planning for capital projects.

Decrease in Scope and Cost. Reducing projects to a smaller scale or using material and systems having lower life expectancy.

Organizing these categories into a specific set of guidelines enables discrete decisions on projects by priority level. A project as identified by the facilities audit, is scored on a point basis and is ranked. A review of each project leads to a final designation of priorities based on grouping projects for the same building or utility system into a single decision package. The priority levels and point values are shown in Figure 2-2.

Figure 2-2. PROJECT PRIORITY LEVELS

PRIORITY LEVEL I		Point Value
I-1.	**Life Safety and Legal Compliance** a. Hazardous life safety building or site conditions that jeopardize people, programs, equipment; unless corrected will cause suspension of facilities use. b. Repairs, renovation, and improvements required for immediate compliance with local, state, and federal regulations.	10
II-2.	**Damage or Deterioration to Facilities** Repairs, renovations, and improvements to facilities that, unless corrected, will lead to a loss of a facility.	9
III-3.	**Cost Effective Measures** a. Repairs, renovations, and improvements required to prevent serious facility deterioration and significantly higher labor costs if not immediately corrected. b. Energy conservation to reduce consumption with a rapid return on investment.	8

PRIORITY LEVEL II

II-1. **Mission Support** 7
Actions required to maintain program or institutional accreditation.

II-2. **Delayed Priority I** 6
Repairs, renovations, and improvements less compelling than Priority I. Essential are actions to permit safe occupancy of buildings and site, including life safety items and code requirements.

II-3. **Deferred Maintenance** 5
a. Repairs, renovations, and improvements whose deferral will lead to more serious building conditions, hamper program activities, offset building utilization, or curtail economies of operation.
b. Preservation of structures of historic importance due to building design, campus esthetics, building technology or association with important people or events.

PRIORITY LEVEL III

III-1. **Project Completion** 4
Funding for building or site improvements left unfinished because of inadequate funding or other reasons. Improvements are necessary for proper functioning, economic maintenance, and suitable appearance of new construction.

III-2. **Delayed Deferred Maintenance** 3
Repairs, renovations and improvements that can be postponed.

III-3. **Anticipating Actions** 2
Actions carried out in anticipation of longer range institutional development including land acquisition, infrastructure elements and advance planning for capital projects.

PRIORITY LEVEL IV

IV-1. **Reduction in Scope** 1

IV-2. **Deferrable** 0

Implementing the Priority Selection Process

The process of selecting project priorities is a series of seven steps (Figure 2-3). Interaction between senior campus administrators and the building and grounds committee of the governing board is valuable in determining policy objectives. For example, admissions/registrars can provide facts on enrollment trends in numbers and by programs and departments—essential information when making final decisions on project priorities.

Figure 2-3. SETTING PRIORITIES

1. Facilities Audit
2. Funding Categories
   a. Operations & Maintenance
   b. Capital Construction
   c. Capital Renewal & Replacement
   d. Annual Operating Budget
   e. External Funding

3. Project Priority Criteria

4. Assess Priorities with Objectives

5. Intangible Factors

6. Project Ranking

7. Decision Packages

Step 1. Facilities Audit. A comprehensive audit of an institution's owned buildings, grounds, and utilities for existing conditions and functional adequacy.

Step 2. Funding Categories. Projects identified in the facilities audit are sorted by appropriate funding categories. Projects small in scope or cost are designated as plant operations and maintenance in the annual operating budget. Capital construction projects represent new construction or major additions to be funded. The remaining projects are ranked by priority as capital renewal and replacement projects.

Step 3. Project Priority Levels. Capital renewal and replacement projects are ranked by point value for the nine subcategories shown in Figure 2-2. Other projects may be advanced in priority because of deteriorating conditions. Projects concerning functional adequacy, equipment replacement, or mission support will require opinions from outside sources represented by Steps 4 and 5.

Step 4. Assess Priorities With Objectives. Clarifying policy objectives may prove difficult because of different priorities within an institution. Goals of individual academic units or auxiliaries will have to be solicited from senior campus administrators along with overall institutional objectives.

Step 5. Intangible Factors. Affecting Step 4 are intangible factors operating outside of technical evaluations of facility conditions. This requires input from users of a facility or cost-center managers. Also involved are the judgments of senior campus administrators.

Step 6. Project Ranking. The ranking of projects is an interactive process involving Steps 3, 4, and 5. Facility conditions, timing, intangible factors, and financial aspects are key factors.

Step 7. Decision Packages. Funding and organization of projects for efficiency are summarized in the final step. Senior campus administrators are presented with a collection of decision packages organized by priority by cost centers. The presentation should include: (1) a summary list of proposed projects; (2) projects by Priority Levels I, II, and III; and (3), a detailed description of projects for the separate categories of buildings, grounds, and utilities.

A final summary of recommended projects is reached after a review by senior academic and financial officers of an institution.

The process of selecting project priorities is a systematic categorization to arrive at funding decisions. Included are: identifying all needs, differentiating repairs and renovations from new building projects, tabulating costs of physical plant improvements, determining priorities, and requesting funds. During this cycle of (a) articulated need, (b) reviews and revisions, (c) recommended funding, and (d) funding decision, all parties may or may not concur on priorities. Thus, priority selection becomes a policy decision.

Occasionally, first priorities for available funds are bypassed and lower priorities advanced. This seems to be particularly true in selecting academic improvement projects over repair and renovation projects. For these reasons, it is essential that an institution use the facilities audit as the basis for developing a facilities improvement policy to meet the funding needs of observed conditions.

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[1] McLintock, David L. Formula Budgeting-An Approach to Facilities Funding, Assoc. of Physical Plant Administrators, Washington, D.C. (1980).

[2] Finn, D.F., and Peltasin, Jack W.: "NACUBO Recommends Solutions to Problems in Implementing Federal Price Standards," Business Officer, National Association of College & University Business Officers, October 1979.

[3] Jenny, Hans H. et al, Hang-Gliding or Looking for an Updraft, The College of Wooster and John Mintner Assoc, Inc., Wooster, Ohio and Boulder, Colo. (1981).

[4] BRICKS AND MORTARBOARDS, Educational Facilities Laboratories, New York NY 1946 (P161).

CHAPTER THREE

Requirements for Capital Renewal and Replacement

How much is an adequate level of annual funding for capital renewal and replacement? It is unlikely that most institutions are "cash-rich" or have adequate reserves to fund capital renewal and replacement on a one-time basis. A reasonable level of annual funding to address priority projects should be established in the budgetary process.

This chapter addresses the question of annual levels for funding capital renewal and replacement, with a brief review of formula funding methods. This is followed by funding guidelines based on a predictable annual portion of total plant replacement value. As background, life cycle concepts and methods of estimating annual funding levels are presented, along with techniques for institutional fiscal analysis of resources allocated to capital renewal and replacement requirements. Sources of funding capital renewal and replacement are discussed in the next chapter.

A facilities audit helps to establish campus priorities and capital renewal and replacement funding requirements. Full funding of the priorities through available institutional funds, new governmental allocations, debt financing, fund raising, or any combination of these sources are options for attacking the problem. Another approach establishes an annual level of funding in the operating budget for capital renewal and replacement needs. In actual practice, both methods may be necessary to eliminate backlogs of deferred maintenance and to keep pace with ongoing needs for renewing and replacing buildings, grounds, utilities, and equipment.

Methods of funding capital renewal and replacement vary at different institutions. Practices include funding from operating budgets, capital budgets, or a combination

of both. Whichever practice is followed, the procedure is rarely based on institutional policy that provides adequate funding for capital renewal and replacement needs. Governing boards and senior campus administrators have a responsibility to determine a regular allocation from the operating budget; in addition, trustees and administrators should defend this practice when faced with competing demands of institutional budgets.

The important principle for policy makers to remember is that a one-time elimination of current renewal and replacement priorities does not solve the problem. As campus facilities continue to deteriorate and become obsolete, an annual allocation for capital renewal and replacement may be necessary to prevent future accumulation of deferred maintenance. Establishing an appropriate level of annual funding in the beginning of a program may have to include "catch-up" costs. As needs are reduced to manageable proportions, the operating budget can accommodate priorities as they are identified. The end result is a program that maintains campus facilities in good repair, so they are functionally adequate for teaching, research, campus life, and public service.

Confusion between the facilities audit and annual levels of funding capital renewal and replacement should be avoided. The audit determines existing conditions and guides selection of priorities; annual funding establishes in the operating budget the means to handle the aging process of facilities and equipment. Typically, funding for capital renewal and replacement comes from operating budget residuals, if available; which is how most institutions reached their current levels of deferred maintenance. Rather, they should establish an appropriate level of funding in the operating budget to help prevent the continuing deterioration and obsolescence of facilities and equipment.

Methods for defining annual funding levels for maintenance and capital renewal and replacement programs are traditionally one of the following types:

1) **Straight Line or Historical Budgeting.** The previous year's budget base is incremented by a certain percentage annually to compensate for identified changes such as inflation, fluctuations in enrollment and employees, and program modifications.

2) **Formula Budgeting.** Annual maintenance needs are expressed in terms of cost per square foot, or number of full-time employees per square foot, or a certain percentage of current physical plant value. This amount is to be set aside annually.

3) **Survey of Needs.** A comprehensive facilities audit is conducted to identify and quantify all current maintenance deficiencies for special funding of single- or multiple-year programs.

Each of these methods has one or more major deficiencies.

The straight line or historical funding method does not match funding levels against identified needs, and the established base being incremented cannot be validated. Formula budgeting shares the same drawbacks by not addressing the specific needs of a physical plant; it is further cast in doubt by the age-range of campus facilities, their use, and construction materials.

Both historical and formula budgeting assume that the plant renewal requirements will occur at a constant rate. This assumption is inappropriate because of the varying life cycles of both facilities and their installed subsystems. Use of life-cycle concepts provides a quantitative method for predicting annual levels of capital renewal and replacement that addresses both the short- and long-term needs of the physical plant.

The surveys of needs method provides an accurate assessment of immediate priorities. Provisions are omitted for identifying long-term requirements. This limitation must be overcome if the planning and budgeting process is to be successful.

Life-Cycle Concepts

Guidelines for annual funding of capital renewal and replacement derived from life-cycle concepts aid in determining aggregate funding levels without designation of specific projects. This method of capital budgeting and planning provides flexibility in determining which projects will be funded in any given year. There is also confidence that funds are available to meet renewal and replacement needs.

Stanford University developed the following life-cycle concept model:[1]

> "The basis of this framework is that actuarially predictable cycles exist for facilities renewal and replacement (i.e., the components or subsystems of a facility, such as plumbing, roofing, electrical, heating, ventilation, air conditioning, and installed equipment have identifiable life expectancies and will require replacement after predictable periods of time. These cycles will continue to repeat themselves for as long as the facility continues to serve its intended functions. Of extreme importance to the planning and budgeting administrator are the magnitude (constant dollars) of these replacements and the date when they must take place. The associated replacement costs (in specified cycles) will approximate the annual reinvestment necessary to maintain the physical plant."

Several institutions have used the life cycle method to calculate annual funding levels. They recommended using a range of 1.5 to 3 percent of the total replacement value of the physical plant. Stanford University completed a detailed analysis of building systems components using replacement cycles for five-year increments over a 100-year period in current dollars. Stanford's conclusions were that from 1.5 to 2.6 percent of the current replacement value of plant would be the appropriate annual funding level for repairs and replacement.

The University of California System analyzed 119 separate maintenance elements over a 50-year period to develop a maintenance budgeting formula. Their conclusions were that a range of 0.8 to 1.25 percent of plant replacement value be allocated to campus maintenance (depending upon building age, air conditioning, and other factors). Additional funding for priority projects is made available through capital budgets.

Governing boards and campus administrators at these institutions and others using life cycle concepts have relied on empirical analysis to determine adequate annual levels of funding for budgetary purposes.

Figure 3-1. LIFE CYCLE COST ANALYSIS FACTORS

	Cost Category	Costs Potentially Included
1	**INITIAL CAPITAL INVESTMENT COSTS.** Costs associated with the initial planning, design, and construction of the facility.	Land costs, including costs of acquisition, options, surveys and appraisals, demolition and relocation, legal and filing fees. Design costs including cost of consultants and/or in-house staff as well as required special studies or tests (e.g., test borings). Construction costs including costs of labor, material, equipment, general conditions (job overhead), contractors, main office overhead, and profit. Other owner costs, including cost of owner project administration, construction insurance, permits, fees, and other expenses not included above.
2	**FINANCING COSTS.** Costs associated with financing capital investment.	Loan fees and one-time finance charges associated with borrowing for the project—both for initial project development as well as major capital improvements. Interest costs for short-term (interim) financing. Note interest costs for long-term (permanent) financing usually are considered in establishing the discount rate for the life cycle cost analysis, and are not included as costs in the analysis proper.
3	**FACILITY OPERATION AND MAINTENANCE (O&M) COSTS.** Costs associated with the ongoing operation and maintenance of the facility.	Personnel costs for routine maintenance, cleaning, grounds care, trash removal, space reconfiguration, security, building operation, property management, etc. Costs of fuel, utilities, supplies, equipment and contract services associated with these activities should also be included.
4	**FACILITY REPAIR AND REPLACEMENT COSTS.** Costs associated with restoring the facility to its original performance.	Costs of major repairs to building elements during the analysis time frame. Costs of planned replacements of building elements during the analysis time frame. Includes costs of planning, design, demolition and disposal and other owner costs, as well as costs for labor, materials, equipment, overhead, and profit of any outside contractors.
5	**FACILITY ALTERATION AND IMPROVEMENT COSTS.** Costs associated with planned additions, alterations, major reconfigurations and other improvements to the facility.	Costs of all planned improvements during the analysis time frame. Includes costs of land, planning, design, demolition, relocation, disposal, and other owner costs as well as costs of labor, materials, equipment, overhead, and profit of any outside contractors.
6	**FUNCTIONAL USE COSTS.** Costs associated with performing intended functions within the facility.	Salaries and benefits of personnel working in the facility, as well as supplies and services required for the program housed in the facility. Income and real property taxes. Denial-of-use and lost revenue costs associated with delayed or inappropriate scheduling of occupancy, or with using the facility inefficiently. Includes continuing rent, unexpired lease, operating in obsolete facilities, etc.
7	**SALVAGE COSTS.** Costs (or values) of building elements or facilities salvaged during the analysis life cycle.	Costs of salvage operations including demolition and disposal, if not included. Salvage values of building elements or facilities recovered as part of replacement, alteration, or improvement activities.

Source: LIFE CYCLE COST ANALYSIS: A GUIDE FOR ARCHITECTS. Washington: American Institute of Architects, 1977 (pp. 18-19).

However, use of a generally accepted range of percent replacement value of plant should not overlook existing building conditions. Because of possible deferred maintenance, guidelines for renewal and replacement based on building system life cycles must be adjusted for the levels of regular maintenance performed on facilities. Evidence of

deferred maintenance will require adjustments to estimates of replacement cycles and recommendations for capital funding to bring facilities into a "new" condition when forecasting realistic levels of annual levels of funding renewal and replacement. The following section describes the life cycle concept in greater detail, and explains the method for calculating a guideline for capital renewal and replacement based on total replacement value of plant. The results are guides that offer confidence to governing boards and campus administrators in using the life cycle method for adopting an annual level of funding in the operating budget.

Guidelines for Determining Annual Funding Levels

The life cycle concept of analyzing annual levels of renewal and replacement funding can become extremely complex, but is based on a relatively simple definition.[2, 3]

> "any technique which allows assessment of a given solution or choice among alternative solutions on the basis of considering all relevant economic consequences over a period of time (or 'life cycle')."

Figure 3-1 illustrates seven factors used in a comprehensive life cycle cost analysis. Although only repair and replacement costs (Item 4) are being discussed here as a guide to determine annual levels of funding, attention should be paid to costs of initial capital investment, financing, facility operation and maintenance, functional use, and salvage in the preliminary analysis of project priorities.

In developing a life cycle analysis, the following factors have an impact on replacement cycles and the resulting renewal and replacement costs:[4]

Facility Type. Subsystems and associated costs vary widely across the range of classifications of facilities.

Facility Subsystems. Quantity and quality of installed subsystems within a facility will determine replacement requirements.

Subsystem Life Cycles. Predictable life of a subsystem will determine when future requirements occur.

Subsystem Cost. Unit replacement cost will determine the cost of future requirements.

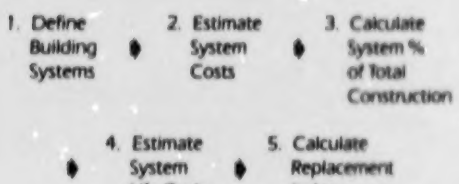
Date of Construction. Future time when requirements will occur is determined by the initial construction date of the facility and subsystems.

Replacement Index. The analysis of a building's systems with life cycles for each system and component produces a replacement index. The index is expressed as a percent value equivalent to the portion of a building that must be replaced annually. The replacement index for different building types can be averaged for a campus replacement index and represents guidelines for annual funding of capital renewal and replacement.

Steps in developing a replacement index are illustrated in Figure 3-2.

General sources for information on building types, systems, and costs of each system per square foot are found in standard estimating guides: DODGE CONSTRUCTION SYSTEMS COSTS, MEANS BUILDING SYSTEMS COST GUIDE, or BER-

Figure 3-2
DEVELOPING A REPLACEMENT INDEX


1. Define Building Systems
2. Estimate System Costs
3. Calculate System % of Total Construction
4. Estimate System Life Cycle
5. Calculate Replacement Index

GER BUILDING AND DESIGN COST FILE. Other guides for system description are UNIFORMAT of the American Institute of Architects or the specification organization system of the Construction Specifications Institute. These are not substitutes for existing campus or system information, and where available, costs for local conditions should be used.

A sample calculation of a replacement index for an academic classroom and office building is illustrated in Figure 3-3. Each column represents a step in developing a replacement index.

STEP ONE - Building Systems. The 15 building systems outlined in column 1 are those used in DODGE CONSTRUCTION SYSTEM COSTS. Other items may be added, such as: general conditions, contractor overhead and profit, site work, etc. It is important that a uniform listing of building systems be used for consistency in the factors used to develop replacement indexes.

Figure 3-3: Repair and Replacement Index for a Classroom and Office Building

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
Building System	Cost per gross square foot	Percent of total construction	Average years before replacement or repair extended life	Repair and replacement index = percent per year of total value
1. Foundations	$ 1.72	2.3%	100	.0230%
2. Floors on grade	1.58	2.1	100	.0210
3. Superstructure	11.40	15.2	100	.1520
4. Roofing	0.82	1.1	20	.0550
5. Exterior walls	5.62	7.5	50	.1500
6. Partitions	5.18	6.9	50	.1380
7. Wall finishes	3.30	4.4	10	.4400
8. Floor finishes	2.78	3.7	10	.3700
9. Ceiling finishes	2.55	3.4	25	.1360
10. Conveying systems	—	—	—	—
11. Specialties	2.40	3.2	25	.1280
12. Fixed equipment	7.65	10.2	40	.2550
13. HVAC	13.50	18.0	25	.7200
14. Plumbing	6.52	8.7	40	.2175
15. Electrical	9.98	13.3	40	.3325
TOTALS	$75.00	100.0%		3.138%

STEP TWO-System Costs. The cost per gross square foot shown in Figure 3-3 is obtained from average national costs of university classroom buildings (1981 DODGE CONSTRUCTION SYSTEM COSTS). Costs for contractor overhead and profit and for general conditions are distributed to each system as part of the total $75 per square foot. Local campus costs can be substituted for system costs when available or obtained from local contractors.

STEP THREE-System Percent of Total Construction. The next step in the analysis is the calculation of the percent of total construction for each subsystem (column 3). This percentage is obtained by dividing the cost of each subsystem into the total construction cost of the entire system. For example, in the illustration, foundations (Line 1) cost $1.72 per gross square foot or 2.3 percent of total construction cost.

STEP FOUR-System Life Cycle. Various sources provide the average year before replacement or major repairs are required to extend the life of a system. Included are the previously referenced estimating guides, the U.S. Internal Revenue Service guidelines, BOECKH'S BUILDING VALUATION MANUAL, and MARKEL'S APPRAISAL GUIDE. Analysts will find a campus evaluation of deferred maintenance and renovation work will suggest either reducing or extending the life cycle of a building system.

STEP FIVE-Repair and Replacement Index. The final step in the analysis is to multiply the percent of total construction cost (Column 3) by replacement life (Column 4) to produce a replacement index for each subsystem (Column 5). The total of the 15 subsystem indexes results in a replacement index for the building type (3.138%).

Analyses using this procedure can be performed for various facility types in the following categories:

- Classrooms
- Offices
- Laboratories
- Libraries
- Physical Education
- Residences
- Patient Care
- Other (storage, farm, etc.)

The summary of the analyses of different building types produces replacement indexes that then can be averaged for an overall campus facility replacement index. This final result provides a guide for annual funding levels of capital renewal and replacement based on life cycle concepts. Once calculated, a replacement index is available for local campus conditions that can be updated for additions to plant and cost escalation. As a planning and budgeting tool, it provides confidence that plant renewal is adequately funded. Stanford University administrators found that inordinately large funding requirements in outlying years could be predicted—and actions taken to meet identified needs—by including the replacement method in its "Facilities Plant and Funding Forecast."[4]

In practice, the recommended level of funding capital renewal and replacement is incorporated as a guideline into the operating budget for annual expenditures. A plant reserve fund created from current funds or unrestricted endowments serves as a balance by accumulating unexpended funds as a reserve for unexpected needs. The key in avoiding excessive accumulation of plant renewal requirements is to maintain a financial discipline represented by guidelines and regularly funded plant renewal.

Institutional Fiscal Analysis

The purpose of a capital renewal and replacement allocation in the annual operating budget is to fund plant renewal needs. Nonprofit activities such as higher education have traditionally segregated their plant funds and have generally ignored depreciation. This is based on the premise that plant funds were originally given or appropriated as restricted and irrevocably committed to fixed assets so that they will never be available for any other purpose. Also, that renewal and replacement funds would come from future restricted funds. However, colleges and universities not only make capital expenditures from current funds, but transfer operating funds for plant renewal and replacement, which could be considered a flow of depreciationlike expenses. An appropriate capital renewal and replacement allocation in the operating budget offsets the gap between inadequate current funds and a charge for depreciation.

Guidelines for annual funding of capital renewal and replacement introduces the question: How much is regularly spent for plant renewal? A corollary question is: How much is an acceptable backlog for campus deferred maintenance?

Two sources providing background for understanding these questions of institutional fiscal analysis are FINANCIAL RESPONSIBILITIES OF GOVERNING BOARDS published jointly by the Association of Governing Boards of Universities and Colleges (AGB) and the National Association of College and University Business Officers, and NACUBO's FINANCIAL SELF ASSESSMENT-A WORKBOOK FOR COLLEGES. The first source reveals some of the mysteries of financial statements with a detailed analysis of plant fund expenditures. The second reference provides ratios of various factors to help assess the financial health of an institution.

A ratio of current renewal and replacement funding to total replacement value provides a comparison to a recommended funding guideline. Information on current funding is obtained from "Statement of Changes in Fund Balances" under revenues, usually described as "expenditures for plant facilities including charges to current funds." Practices reflected in some financial statements allocate renewal and replacement under expenditures from current operations, mandatory transfers for debt retirement (not interest) and for renewals and replacements, and allocations of restricted endowments to plant. This comparative ratio should be prepared by the campus chief financial officer, because of variations in accounting techniques.

Financial statements usually do not represent the total replacement value of plant but use the book value of acquiring buildings, grounds and equipment. The replacement value can be obtained by calculating the current cost of buildings, grounds, and equipment or by referring to insurance values if they are updated for current costs of replacement.

Contributions to renewal and replacement may also be occurring in addition to those recorded under "Changes in Fund Balances." The oversight occurring in the assessment of total renewal and replacement funding is that any expenditures for renovations and plant additions can be a part of renewal and replacement. The failure to recognize funding from these two sources —operation and plant maintenance from current funds, and capital allocations for plant additions as components of overall

repairs and replacements—underestimates the total funding for repairs and renovation.

institutions and systems of higher education may be consistently reaching a suitable level for repairs and replacements when all funding sources are aggregated. Some of this oversight is explained by the difficulty in assessing the appropriate portion of annual operations and maintenance that contribute to repair and replacement. Replacing a portion of a mechanical or electrical system in conjunction with modernizing a laboratory or administrative office suite also contributes to renewal and replacement goals.

Another component of the unrecognized contribution to renewal and replacement is the funding of plant additions. New facilities often replace existing space included in renewal and replacement funding needs. There is difficulty in recognizing that capital appropriations for new construction may be a part of funding for repair and renovation because of the episodic nature of projects. Judgment is required in determining whether the major renovations, remodelings, or plant additions represent replacement and is allocated on an annual basis. The final question in the institutional fiscal analysis of appropriate funding levels for capital renewal and replacement is: What constitutes an acceptable level for an institutional backlog of deferred maintenance? One approach is a comparison to similar institutions. Unfortunately, comprehensive national data for comparisons to institutions of similar enrollments and missions do not exist.

NACUBO's FINANCIAL SELF ASSESSMENT[5] suggests a method for calculating a ratio to monitor deferred maintenance:

> Estimate of deferred maintenance divided by Education and General Expenditures plus Mandatory Transfers equals Deferred Maintenance Ratio as shown below:

$$\frac{\text{Deferred Maintenance}}{\text{E \& G + M.T.}} = \text{Deferred Maintenance Ratio}$$

By comparing the ratio of deferred maintenance needs with the expenditures at the end of each fiscal year, a better understanding of capital renewal and replacement requirements can be obtained. When the ratio exceeds three percent, it is likely that the normal revenues of the institution will be unable to reduce facility neglect. An increase in the ratio should be a warning that actions must be taken to correct conditions; a decrease in the ratio reflects positive steps taken to address capital renewal and replacement needs.

A final note concerning institutional fiscal analysis deals with depreciation of facilities. Because generally accepted accounting principles followed by most colleges and universities ignore the depreciation as a current operating expense, there is no acknowledgement for deterioration of facilities on most of their balance sheets. In seeking to sway higher education to include a depreciation charge as an expenditure item, Hans Jenny has recently put forth arguments for adopting this strategy. In HANG-GLIDING OR LOOKING FOR AN UPDRAFT[6], Jenny suggests that a capital charge of a minimum expenditure component should be built into the annual budget to cover long-range capital needs.

Until accounting principles change, it is unlikely that proposals of this sort will be

adopted. However, depreciation accounting is of value to research institutions in recovering costs at a higher annual rate on federally supported projects. Replacement and life cycle concepts are components of depreciation calculations and can be used in the allocation of costs for buildings and equipment according to the space used by sponsored projects.

Addressing the capital renewal and replacement needs with life cycle or depreciation concepts offers institutions an opportunity for comprehensive facilities management. Once management has formally identified the useful lives of buildings and equipment, it can better measure the appropriate funding levels and plan for renovating and replacing them.

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[1] Biedenweg, Frederick M. and Hutson, Robert E., "Before the Roof Caves In—A Predictive Model for Physical Plant Renewal," ASSOCIATION OF PHYSICAL PLANT ADMINISTRATORS NEWSLETTER, July, 1982. Also, in NACUBO BUSINESS OFFICER, June, 1983.

[2] LIFE CYCLE COST ANALYSIS: A GUIDE FOR ARCHITECTS. American Institute of Architects, Washington, D.C. 1977.

[3] Haviland, David S.; LIFE CYCLE COST ANALYSIS 2: USING IT IN PRACTICE. The American Institute of Architects, Washington, D.C., 1978.

[4] Biedenweg and Hutson. Op Cit.

[5] Dickmeyer, Nathan and Hughes, K. Scott, FINANCIAL SELF-ASSESSMENT: A WORKBOOK FOR COLLEGES. National Association of College and University Business Officers, Washington, D.C. 1978.

[6] Jenny, Ha. s H., Hughes, Geoffrey C. and Devine, Richard D. HANG-GLIDING OR LOOKING FOR AN UPDRAFT. Wooster, O.: The College of Wooster and John Minter Associates, Inc., 1981.

CHAPTER FOUR

Funding Sources

After all the funds have been wrung out of unrestricted gifts, gifts restricted to plant, endowment income and transfers from auxiliary enterprises, and after the plant fund has been drained of any reserves, there are only three sources left available to finance capital renewal and replacement: the operating budget, assets which can be converted and external sources.

Stated succinctly, this means managing the current fund for greatest effectiveness, reexamining current assets, and raising money from gifts, grants and long-term financing.

These sources may already be stretched to the breaking point to meet operating needs, to pay off unwise ventures in capital construction, or other unfunded debts. Certainly, in a time when tuition increases of 15 percent in the independent sector are not uncommon, and many public systems of higher education have seen no budget increases for two or three years—representing a net reduction due to inflation—it is expected that the operating budget, all available convertible assets, and external sources already have been heavily tapped to maintain financial stability.

Introducing an annual level of renewal and replacement funding as a new item in the operating budget therefore requires fresh financial resources. Since current income represents the most readily available source of funding for capital renewal and replacement, it is given extensive treatment in the first part of this chapter. Part two of this chapter provides suggestions for additional ways of adding revenue to current funds.

Part One-Current Funds

Managing for Results

Current funds require prudent management to meet their potential as a source for funding capital renewal and replacement projects. Unfortunately, the budgeting practices in higher education generally limit management to securing compromises be-

tween different competing demands and adjusting revenues and expenditures on an incremental basis. The result is an ongoing struggle to maintain a balanced budget or to minimze deficits. In this climate, reserves to repair facilities or replace equipment are often absorbed in cost control.

Managing current funds requires a broad based approach to generate additional income for capital renewal and replacement from operating budgets. This approach begins with managing higher education institutions for their own functions, missions and objectives, followed by identifying opportunities for increasing revenues and controlling expenditures. This tough-minded task must be inspired by the governing board, endorsed by the chief executive and transmitted to all administrators responsible for managing the institution's fiscal, human and physical assets.

Managing requires setting priorities and closely scrutinizing those activities that contribute to the performance of an institution. By applying this discipline to the budgeting of current funds, potential sources for capital renewal and replacement can be identified and established as an annual budget line. The process examines revenue and expenditure allocations for strategies to increase revenues and control expenditures.

Generalizations such as "increased tuition" and "cuts across-the-board" can do the trick, but are so shortsighted that they have to be viewed as a last resort, as the antithesis of good management. Revenue and expenditure of institutions vary greatly in composition by size, mission, and sector of support. These variances dictate specific strategies formulated to address different institutional characteristics.

Current Funds and Revenues

For purposes of formulating strategies for renewal and replacement funding, current fund revenues can be organized into three groups: (1) tuition and fees; (2) external sources—government, private gifts, and endowment income; and (3) sales and service of educational or auxiliary operations.

An inspection of each group by level and sector of institution leads to suggestions based on the impact of proportional change to a revenue source.

Tuition and Fees

Revenue from tuition is the cornerstone of most independent college and university operating budgets, and such revenue is an important factor at public institutions. Increased tuition can provide a source of funds for capital renewal and replacement. However, in this decade of dramatically declining enrollments, galloping energy costs and retrenchment, substantial increases in tuition are probably ill advised.

One approach to keeping tuition and fee adjustments at a level comparable to cost of living increases includes: maintaining admission levels among traditional students, increasing the enrollment of nontraditional students, and reducing attrition of enrolled students. The loss or gain of revenues per student—ranging from an average of $10,000 in independent institutions and $6,000 in the public sector—shows that efforts in these areas can have greater short and long-term benefits than excessive tuition increases. In the final analysis, increasing revenues by raising tuition is constrained by market resistance, political pressures and the reality of national economic conditions.

External Sources

The major revenue source offsetting the gap between tuition and operating costs is a mix of government appropriations, grants and contracts, gifts and endowment income. The external sources of income vary widely between the public and independent sector and by type of institution; providing approximately 65 percent of the budget for the public sector and 31 percent for the independent sector.

The public sector universities are heavily dependent upon federal and state government appropriations, grants, and contracts. Independent sector universities are also dependent upon these sources but to a lesser degree than their public sector counterparts. Government subsidized student aid is not usually recognized as an "external" source, but its contribution adds to the overall dependency by both sectors on government support.

Private gifts and endowment funds contributed $4 billion in 1981 to current fund revenues of nigher education, and additional amounts to plant funds for capital construction. Independent institutions derived more than 14 percent of their revenues from these sources; public institutions almost five percent. A significant growth has been seen in recent years as institutions concentrate their efforts on increasing their revenues.

The unrestricted portions are particularly attractive for renewal and replacement funding because of institutional flexibility in allocating these funds.

In both the independent and the public sector, development efforts should be expanded among alumni, corporations and foundations to generate funds from these sources to support current funds and offset demands on the operating budget for capital renewal and replacement.

Sales and Service

Educational activities and auxiliary enterprises sell goods and services to faculty, staff, students and the public. Revenues include funds which are incidental to institutional missions.

Educational activities derive revenues from special programs, publication sales, testing services, film rentals, and sales from agricultural or other manufacturing units. Included in auxiliary enterprise revenues are direct charges to faculty, staff, students and the public for residence halls and housing, food services, intercollegiate athletics, college unions, health services, theaters, and parking and transportation.

The following guideposts may be used for assessing educational and auxiliary activities: (1) Are the activities essential to the purpose of the institution? (2) Are full costs being recovered? (3) Will increases or reductions in capital or operating expenditures be cost effective? (4) Are the activities appropriate to the nonprofit and tax-exempt status within local jurisdictions?

Current fund revenues by sector support and level are illustrated in Figure 4-1.

Current Funds: Expenditures

The potential for reducing current fund expenditures to free up resources for renewal and replacement is guided by the labor intensive nature of higher education and permanency of its physical plants. Approximately 73% of total expenditures for the

Figure 4-1

Distribution by Percentage of Current Fund Revenues by Type and Control of Institution—FY 1981

	Percent of Total Revenues			
	Public		Independent	
	Subtotals		Subtotals	
Universities				
Tuition and Fees	12.7		27.5	
Government Appropriations	41.4		2.2	
Federal Government		1.8		1.2
State Government		39.4		1.0
Local Government		0.2		—
Government Grants and Contracts	15.1		19.7	
Federal Government		13.3		18.3
State Government		1.5		0.6
Local Government		0.3		0.8
Private Gifts, Grants, and Contracts	3.9		8.5	
Endowment Income	0.8		5.6	
Educational Activities	3.3		3.5	
Auxiliary Enterprises	12.8		8.8	
Hospitals	7.3		13.8	
Other Sources	2.4		3.4	
Independent Operations	0.3		7.0	
	100.0%		100.0%	
Other Four Year Institutions				
Tuition and Fees	12.0		43.7	
Government Appropriations	51.9		2.1	
Federal Government		4.2		0.8
State Government		46.9		1.3
Local Government		0.8		—
Government Grants and Contracts	10.3		9.1	
Federal Government		8.6		7.5
State Government		1.4		0.9
Local Government		0.3		0.7
Private Gifts, Grants and Contracts	2.1		10.1	
Endowment Income	0.3		4.9	
Educational Activities	1.8		0.8	
Auxiliary Activities	10.3		14.7	
Hospitals	9.2		5.6	
Other Sources	2.1		4.8	
Independent Operations	—		4.2	
	100.0%		100.0%	

Figure 4-1

Distribution by Percentage of Current Fund Revenues by Type and Control of Institution—FY 1981

	Percent of Total Revenues			
	Public		Independent	
Two Year Colleges		Subtotals		Subtotals
Tuition and Fees	15.2		64.0	
Government Appropriations	65.9		2.7	
Federal Government		1.1		1.2
State Government		48.3		1.2
Local Government		16.5		0.3
Government Grants and Contracts	8.2		4.4	
Federal Government		5.7		3.2
State Government		2.0		0.9
Local Government		0.5		0.3
Private Gifts, Grants and Contracts	0.4		7.7	
Endowment Income	—		1.8	
Educational Activities	0.5		1.2	
Auxiliary Enterprises	6.4		14.6	
Other Sources	3.4		3.6	
	100.0%		100.0%	

Source: National Center of Statistics, Financial Statistics of Institutions of Higher Education, FY 1981

average institution are for personnel compensation. The remainder is for contracted services, supplies, equipment and utilities.

Rather than look into the functional categories of expenditures (e.g., instruction, research, public service, etc.) for opportunities to generate cost reductions as a potential source for capital renewal and replacement funds, a more revealing analysis is provided by examining object categories of expenditures and their recent trends. Changes in the categories of expenditures from 1972 to 1982 (Figure 4-2) highlight the possible effects of controlling expenditures and also illustrate the importance of nonpersonnel expenditure reductions.

In a period when costs of contracted services, supplies and equipment increased 164 percent—utilities increased 381 percent—effective management can yield immediate benefits of significant value. Investments for energy conservation which have rapid pay-back periods can be justified even if borrowing is required, for example.

Because colleges and universities have been adjusting to the cost-income squeeze since the early 1970s, the limited flexibility in most institutional budgets cannot be overlooked. Many institutions have already reduced the size of their operations, reallocated resources internally and retrenched faculty, staff and programs to shrink the budget base. In fact, the reduction in expenditures in higher education to offset worsening financial conditions in the past decade has been accomplished at the expense of staff compensation and deferred maintenance, making reports of "balanced budgets" highly deceptive.

Minter and Bowen, in their recent studies of the fiscal conditions of public[1] and independent[2] sectors of higher education, point out that the deferral of maintenance of physical and financial assets represents an "inexorable using up of capital." Adding to this grim picture are the trends of increases of operating costs for fixed assets, and the depletion of existing reserves and endowment to be used for current operations—all at the very time that the urgent need for capital renewal and replacement is occurring.

Part Two—Other Sources

Foundations, Corporations and Individual Donors

Raising funds for construction is a time-honored responsibility greeting every new college president since the founding of higher education in America. It is a unique characteristic of a system that has created a portfolio of plant assets valued in 1982 at $2.3 billion. The patterns of fund raising have changed little over the years, but now they must. Traditionally, supplicating col-

Figure 4-2

Current Fund Expenditures by Object Category by Percent Fiscal Years 1972 and 1982

	Percent of Total Expenditures		Percent Expenditure Increase
Personnel Compensation	**1972**	**1982**	**1972-82**
1. Professional Salaries (Faculty, Administration, Library)	58.0	42.2	+ 80 %
2. Nonprofessional Salaries (Craftsmen, Clerical, Students)	15.0	15.1	111
3. Fringe Benefits	9.0	15.8	193
Subtotal	82.0	73.1	+ 102 %*
Contracted Services, Supplies and Equipment			
4. Services (Data Processing, Communication, Printing, and Miscellaneous)	7.3	6.5	+ 98 %
5. Supplies and Materials	3.5	4.9	152
6. Equipment	2.5	2.6	114
7. Books and Periodicals	1.7	2.5	164
8. Utilities	3.0	10.4	381
Subtotal	18.0	26.9	+ 164 %*
TOTAL	100.0	100.0	+ 113.6%*

Sources: 1. Halstead, D. Kent, HIGHER EDUCATION PRICES AND PRICE INDEXES. Washington: U.S. Dept. of Health, Education, and Welfare, 1975.

2. Research Associates of Washington. HIGHER EDUCATION PRICES AND PRICE INDEXES: 1982 UPDATE. Washington, 1982.

* These totals represent a weighted average.

lege presidents seeking financial contributions wore a path to the doors of corporations, foundations, legislatures and individual donors. As the federal government fueled the expansion of higher education in the 1950s, many college presidents relaxed somewhat in their pursuit of donors as institutions enjoyed relative affluence.

The fiscal crisis surfacing in the 1970s, the loss of public confidence in higher education, and the shrinking federal, state and local support drastically altered the situation. Major fundraising campaigns were hastily created. Initially designed to gain support for operating budgets, these campaigns were expanded to include endowment and capital construction projects. Fundraising efforts, however, rarely included a component for renewal and replacement of existing facilities.

As all good institutional development officers know, fundraising for renewal and replacement requires special strategies to appeal to different constituencies. A presentation with renderings, floor plans and a list of naming opportunities is the traditional method for approaching donors for a new building. At work is the concept of how the donor will be "rewarded." Immortality is promised in a glossy four-color brochure; the gala scene of a ceremonial dedication is suggested along with the gratitude of the thankful college community. Repairing cracked foundations, leaky roofs or replacing obsolete equipment are not very glamorous projects, but they are a reality of renewal and replacement funding.

The challenge is to combine renovation projects, and the less glamorous renewal and replacement projects, into presentations which create the excitement of new building fund campaigns. One strategy for selling renewal and replacement funds is to group the various priority projects into a single package such as "building renovations." In the mass appeal to donors, renovations are elevated to a status equivalent with increasing endowments, scholarship funds and new capital construction. Individual projects are listed and graphically presented in the same style as a new building but placed alongside a variety of other fundraising goals. This approach provides the same sense of importance to renewal and replacement as strengthening the academic enterprise or contributing to the institution's long-term fiscal health.

A benefit of this technique is combining renovation needs with other campaign activities. Organization efforts can be pooled and staff and trustees are focused toward a common goal. Once potential donors are identified, assignments can be made to enable staff and trustees to take the best advantage of each contact. There has been a growth in this type of approach by nonprofit institutions, including higher education. Yale and Columbia Universities are currently conducting campaigns incorporating renewal and replacement with favorable results.

Another strategy develops a campaign solely for renewal and replacement. Individual projects are identified and an area of special interest enticing to foundations, corporations, alumni, or individuals is created. This approach has been successful in gaining endowed chairs and scholarships for a discipline with a unique appeal to particular donors. Renovations of an entire building to convert its use or modernizing outdated equipment can have a similar appeal by matching donor interests with gift opportunities. The development staff, working

jointly with trustees and academic leaders should be able to identify such sources and prepare strategies for funding.

The following is a checklist of steps for developing a renewal and replacement funding campaign:

- A list of priority projects agreed upon by central administration
- Review by academic departments and development staff for categories of potential donors
- Review and approval by governing board
- Preparation of campaign for presentation to alumni, corporations, foundations, and other friends

Use of either strategy—the consolidated fund drive or individual projects—requires a thoroughly prepared list of projects specifying the conditions to be improved. Benefits to a special academic program, faculty or student support programs should be identified for a donor who will find them attractive. If there is support for a distinguished academic department, its record of accomplishments and proposed future activities may find an affirmative response from a trustee, alumni or friend of the institution. Where cost benefits will result from a project, the pay-back period or operating economies should be spelled out.

Capturing the imagination of potential donors requires thoroughness and creativity in proposal preparation. At the core of the proposal is a clear statement of the activity benefitting from a gift. The appeal to the donor must emphasize that an essential program, whether teaching, research, or community service, will be enhanced by the proposed renovation work. Reluctance to seek funds for a roof replacement or leaking plumbing in a chemistry building can be reshaped by highlighting the importance to undergraduate teaching or the need to sustain research activities. The message is that restoring facilities and equipment for programs essential to the institution is just as important as providing space for new programs.

It is encouraging that foundations are now showing interest in proposals for renovation as a tool to contain operating costs as an alternative to plant additions. Recognizing that stable or declining enrollments will reduce the need for new buildings and that renovations will strengthen existing programs and support services portrays realistic institutional stewardship.

The trustee role in the difficult area of renewal and replacement fundraising is especially important. If a program of renewal and replacement does not exist, then the board member should ask why not. This questioning can start the process of an inventory of conditions and definition of priority projects producing a well detailed campaign program. By reviewing and approving a list of projects the governing boards are better prepared to lend their knowledge, experience, and their personal support. The trustee who can introduce a college president or development officer to a potential donor leads the way with personal contact, good will, and possibly his or her own gift.

Government

The massive federal and state government support for higher education in the halcyon days has declined, but limited funds may be available. Expertise in categorical programs and diligent reviews of the "Federal Regis-

ter" can uncover sources of funding for renewal and replacement. Energy conservation grants and housing loans are two programs which are still being funded. Proposals for employment legislation may produce new streams of funds for higher education's renewal and replacement needs.

The American Council on Education, working in concert with the other higher education groups in Washington, D.C., has been effective in addressing legislative proposals which affect the higher education community. These organizations should continue to be considered the best source for help in making the case for government support for renewal and replacement funding, particularly at the federal level. However, they in turn will need the help of administrators and trustees to document the urgent need for this kind of federal funding.

Lobbying efforts at the federal and state level for special projects have rewarded several institutions. Through extensive lobbying efforts based on a well-prepared program, legislators were convinced by combined efforts of campus administrators, trustees, and local business executives to fund projects. Care should be taken, however, to make sure these efforts do not work at cross purposes with nationwide or statewide joint lobbying efforts for all of higher education.

Funding from government sources serves renewal and replacement needs with new facilities, replacing obsolete buildings and equipment, or renovations of existing buildings. Imaginative proposals for government appropriations or grants can be conceived, even in the absence of precedents, and introduced as legislation with the diligent effort of staff, trustees and friends.

Debt Financing

Entry into debt financing for funding capital renewal and replacement must be measured cautiously against institutional policies before considering external borrowing or issuance of bonds. Borrowing for building self-amortizing projects such as residence halls or athletic facilities is a common practice, usually made financially feasible by heavily subsidized interest rates. However, financing projects with borrowings at or near market rates requires careful analysis before collateralizing existing assets and pledging future revenues to repay debt. Careful observation of trends is essential because fluctuations in interest may open or foreclose debt financing possibilities during midstream of capital budgeting.

Debt financing in the open market without benefit of interest subsidies should only be resorted to when conditions have reached emergency levels and all other possible sources have been exhausted. When an institution has reached this point of liquidity it is facing the most dire fiscal crisis.

Possibilities for long-term low interest loans exist through current federal College Housing Loan Programs. Although very competitive, many institutions have funded renewal and replacement and achieved significant energy savings through this program.

Agencies in several states also offer debt financing through issuances of bonds which offer tax-free income to note holders. The attractive rates of return of these offerings place them in a favorable position as a source of borrowings for an institution. In some states higher education qualifies for industrial development or similar forms of bonding. The same caveat applies for all of these statewide agencies and authorities

borrowing sources. A repayment plan based on anticipated revenues or externally raised funds must be firmly in place.

Creative debt financing, with the full faith and credit of state government and accompanied by subsidies of interest rates, can be supported on several grounds. The contribution to regional economic development falls in line with the intent of industrial development revenue bonds.

Similarly, provision of special services ranging from health services to job retraining can easily be fit in with the purposes of specific legislation. Lobbying efforts can be used to support other equally valid programs for the creation of debt financing techniques which will benefit higher education renewal and replacement needs.

Conversion of Assets

Yale University recently made national headlines by selling its "Brasher Doubloon" for $675,000 and Syracuse University sold an S.F.B. Morse painting for $3.2 million. Other independent institutions have quietly disposed of buildings or donated items, sold real estate, or auctioned off surplus furniture and equipment. Conversion of assets can contribute to unrestricted funds for renewal and replacement with appropriate safeguards for gift restrictions.

Guiding the process of divesting assets is the basic criteria of whether or not an item is essential to the mission of the institution. This rule can guide decisions in sale of art works, equipment, or property. Painful as it may be, inventory reduction should be considered as a means of getting rid of expensive problems, and learning how to live with less.

Innovative Techniques—Land Development and Tax Benefits

Undeveloped land and tax depreciation are two assets generally common to higher education but not directly available to their advantage. Through the use of innovative techniques, these assets can create an income source for capital renewal and replacement.

Land often acquired for long-term growth has potential for private development. By working as a developer, or merely as the land-lease holder, an institution can benefit from converting a tax liability to a revenue producing asset with little or no cash investment. A leasing arrangement to private investors avoids tying up institutional capital and can provide lease payments and possible reversion of improvements to the institution after a set period of time.

When entering into land development or lease-back opportunities, a college or university should seek sound legal and financial advice. This may be available from knowledgeable board members or outside guidance may have to be retained. A master plan with land development guidelines should be in place and the institution should carefully determine its own direct and indirect costs as a partner in a development project.

A second innovative technique is the conversion of tax depreciation benefits for private investors which are unavailable to tax-exempt institutions. This represents an alternative to traditional fundraising as an external source of funding for renewal and replacement.

These benefits are attractive to investors, particularly under the Economy Recovery Act of 1981 which allows the investment tax

credit for a rehabilitated building to be claimed by the owner even if the building is leased to a tax-exempt organization.

An alternative to the investment tax credit approach is the use of tax exempt bonds issued by an organization chartered for the purpose of acquiring buildings and/or equipment and leasing it back to an institution. By creatively structuring an opportunity for investors, an institution can lease a facility or equipment funded privately. In exchange for the tax exempt bonds investors provide initial financing and receive lease payments. Reversion of the investment to the institution is a standard feature of this method of creative financing.

These and other innovative techniques should be explored, but with care. Some of them, such as the sale/lease-back arrangement, are under close scrutiny by Congress as this book is being written (January 1984).

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[1] Minter, W. John and Bowen, Howard R. PRESERVING AMERICA'S INVESTMENT IN HUMAN CAPITAL: A STUDY OF PUBLIC HIGHER EDUCATION. Washington: American Association of State Colleges and Universities, et. al., September 1980.

[2] Ibid., INDEPENDENT HIGHER EDUCATION. 1980. Washington: National Institute of Independent Colleges and Universities, 1980.

CHAPTER FIVE

Building Constituencies for Renewal and Replacement

Transferring a program of renewal and replacement for higher education from the pages of this book to America's college campuses requires a plan of action at institutional and national levels. A systematic approach to building constituencies of support is needed for the successful completion of this plan. The major focus of such a plan should be three-fold: maintain a functional, safe, and attractive campus environment that enhances academic excellence; have the ability to attract and retain faculty, staff, and students; and gain external support.

The first step is to make governing boards, campus administrators, and national leaders fully aware of the importance of the issue.

Higher education's challenge to adequately fund capital renewal and replacement is analagous to the national debate on improving public infrastructure including the nation's roads, bridges, sewers and dams. The national infrastructure problem is estimated at 100 times that of higher education. Bridge collapses resulting in tragic loss of lives, the interruption of water supplies, and power losses all affect the entire nation. Unlike higher education's dilemma, the national infrastructure problem has received media attention, thus compelling Congress to begin corrective action.

Pat Choate, author of AMERICA IN RUINS, cited an absence of basic information about infrastructure, including a lack of a national inventory of public works and assessment of conditions, investment strategies, or pri-

orities; no uniform estimate of future investment requisites, and no agreement among governments on the allocation of resources and responsibilities. This description is strikingly similar to conditions in higher education, in its own way a resource equally as valuable as the nation's infrastructure.

The nationwide infrastructure problem and its political attractiveness as a program with the potential to stimulate our national economy has prompted debates in Congress, state houses, and local governments. National and local media are dramatically reporting the issue, thus producing a broad-based support for the diligent maintenance of an urban society that has become fragile because of its failing infrastructure.

While higher education remains comparatively silent on capital renewal and replacement, the lessons from the infrastructure debate are clear: A broad supporting constituency must be formed and a plan of action formulated for public and independent higher education. It is vital that approaches be unified for both sectors, avoiding divisiveness, and that they apply to all institutions.

The leadership for building constituencies and institutional action must come from governing boards and administrators. Higher education leaders must engage national, state, and local elected officials, alumni, potential donors, and the general public in a discussion of this issue. Boards and their chief executives must be armed with a plan of action in response to the public support they are likely to gain from these discussions.

Certainly, the higher education enterprise of this nation cannot be jeopardized by a deteriorating physical plant. The objective of improving conditions is to support educational performance and prevent the decline of a valuable national asset. If institutions are to fulfill their missions of teaching, research, and public service in the decades to come, new policy and financing strategies must be developed. It is incumbent upon members of the higher education community to develop new policies and present recommendations to decision makers at all levels of government, private industry, and philanthropic foundations as well as to their own institutional constituents.

Alerting governing boards and their chief executive officers to the problem of capital renewal and replacement is the major aim of this publication. It is imperative that individual campuses assess the condition of their physical plants and generate funds to support capital renewal and replacement. Though each college and university should address its individual needs, a simultaneous approach may speed substantive action.

An Institutional Plan of Action

Developing a plan of action for solving higher education's capital renewal and replacement dilemma will be a special challenge. In addressing the issue, there will be a temptation to seek a universal answer applicable to public, private, and other kinds of institutions. Realistically, there is no single approach. Instead, a set of strategies must be formulated, one set embracing aspects that guide individual campuses and another at the national level. The objective is to develop a coordinated national plan of action, a partnership between institutional and national levels moving forward simultaneously.

How is the plan of action to be formulated? A major step is the development of programs to eliminate the deterioration of physical plants. Governing boards, chief executive officers, and senior administrators should take the initiative in designing such programs along with their faculties, students, and alumni.

The stakes are not limited to the higher education community; these important assets are vital to national interests. Elected representatives at the federal, state, and local levels may have to intervene unless prompt corrective measures are forthcoming from the members of the higher education community.

The Budget Process

Budgeting is the mechanism of allocating institutional resources. It is a political and competitive process with departments clamoring for funds to meet their individual needs. Unless system and campus administrators recognize the importance of funding capital renewal and replacement, the situation will become worse.

Budgeting capital renewal and replacement funding levels at 1½ to 3 percent of replacement value is useful prior to the results of a detailed facilities audit. When the audit is completed, realistic costs for actual projects can be evaluated for a schedule of improvements. As a part of the campus budgeting process, a financial ratio of renewal and replacement needs guide the appropriate funding levels for physical plant requirements. Use of a mutually agreed-upon ratio in the budgeting process provides a benchmark for annual funding and offers a defined goal for developing external sources of funding to augment campus resources.

Facilities Audit

A comprehensive facilities improvement program, based on the results of a facilities audit, is essential in translating renewal and replacement needs into the campus budgeting process. (Such an audit can most easily be accomplished by using the FACILITIES AUDIT WORKBOOK published by AGB in cooperation with the National Association of College and University Business Officers and the Association of Physical Plant Administrators.) To be successful, a program must be consistent with an institution's overall mission and resources. It also requires involvement by a broad campus constituency to incorporate facility inventory conclusions into the long-range capital requirements, then dovetailing this information with the appropriate annual budget process.

By incorporating a detailed inventory with academic program requirements and an annually updated long-range capital program, funding levels for capital renewal and replacement can be precisely defined. Institutions routinely following this procedure find it works well and serves other purposes, including preparing grant and foundation proposals, controlling purchasing activities, scheduling improvements, measuring budget performance, and maintaining open channels of campus communication.

Building A Campus Constituency

In introducing a comprehensive facilities improvement program, the procedures involved are clear. A program coordinator responsible to a senior administrator oversees the consolidation of the facilities audit with preventive maintenance and repair projects and long-term campus capital construction programs. An annual update of the program is distributed for review and

analysis in order to identify priorities, allocate resources, and defer or eliminate projects.

A committee of senior administrators coordinates the development, consolidation, and preparation of a recommended funding plan. The plan is then incorporated into the appropriate budget processes. The important ingredients in adopting these procedures are a thorough understanding of the need to fund renewal and replacement, sympathetic senior administrators, and a supporting campus constituency.

A plan of action must address several fundamental questions:

- What is the extent of capital renewal and replacement needs?
- What are the appropriate institutional policies for resource allocation to fund capital renewal and replacement?
- What are the most appropriate strategies for campus awareness and public policy for funding capital renewal and replacement?

An Institutional Plan of Action

The guidelines listed above should culminate in an institutional plan of action containing the following elements:

- **Enlist Presidential Leadership**
  Campus committee comprised of trustees, administrators, faculty, students, and alumni representatives.
- **Develop Work Plan**
  Prepare inventory of building conditions, grounds, utilities, and equipment.
- **Inventory Condition**
  Use FACILITIES AUDIT WORKBOOK or existing condition surveys.
  Estimate costs.
- **Select Priorities**
  Determine required levels of funding.
  Disseminate findings to governing board, legislators, administrators, faculty, staff, students, alumni, and local community.
  Seek required resources.
- **Set Funding Requirements**
  Use replacement index or similar replacement life cycle techniques for preliminary purposes.
  Use detailed data from comprehensive condition surveys to establish total needs and annual funding levels.
  Evaluate institutional resource allocation policies for procedures to incorporate funding for capital renewal and replacement in annual budgets.
- **Create Public Awareness**
  Incorporate capital renewal and replacement policies in overall institutional advancement programs.
  Use existing and develop new internal and external communications techniques for presentations to governing boards, administrators, faculty, staff, students, alumni, and local community.
  Develop broad base of support within campus community.
- **Seek Resources**
  Presentations to government officials.
  Prepare applications for funding assistance from corporations and foundations.
  Contacts with potential private donors.

A National Plan of Action

Although each college or university needs an institutional plan of action, the enormity of the problem calls for concerted action at the national level. Such a plan should involve the appropriate higher education associations representing trustees and administrators, government officials, legislators, and private sector representatives.

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Why is such an effort needed? The nation's crumbling infrastructure and deferred maintenance among postsecondary institutions share a common problem: low visibility. This critical issue suffers from lack of public awareness. Working together, trustees, presidents, federal and state legislators, and private sector representatives could elevate capital renewal and replacement to a national agenda item. A coalition of education, government, and business leaders could muster strong and continuous media coverage.

Such a coalition might result in the creation of a national task force whose goals would include eliciting public support, influencing public policy, and encouraging increased action at the campus and state levels. These broad goals would be accomplished by a study containing the following components:

- Prepare national inventory and guide institutions in completing detailed inventories of capital renewal and replacement needs and priorities.
- Determine required levels of funding.
- Disseminate findings to legislative bodies, government agencies, national media, educational associations, and institutions.
- Prepare proposals for support to federal, state, and local government; corporations, and foundations.

Conclusions

Many of the themes of this book have already appeared in the publications of the Association of Governing Boards of Universities and Colleges, National Association of College and University Business Officers, and the Association of Physical Plant Administrators. Similar topics have been addressed in annual meetings and professional seminars of the major organizations representing public and independent institutions. Regrettably, the capital renewal and replacement has received attention but little action, except at a few individual campuses.

The dilemma is virtually ignored by the associations representing the academic community because of the concentration on preserving academic activities and the lack of concern for the causes and effects of deteriorating physical plants. Capital renewal and replacement is a subject left to administrators, governing boards, and governments to worry about with sparse recognition of its impact on the academic enterprise. Scholars have appropriately concerned themselves with their basic role of teaching, research, and community service; but their failure to support the needs of their campus's physical plant is now coming home to roost.

Funding for capital renewal and replacement is not at the top of higher education's priority list. Nor has it aroused the attention of the public agencies, corporations, and foundations. Funds for capital renewal and replacement may seem less urgent in a decade where institutions struggle for mere survival. When weighed against declining student enrollment, reduction of faculty, and discontinued programs, capital renewal and replacement is often a low—or lowest—priority.

Realities of rectifying the deplorable conditions of many campus physical plants have been examined here and elsewhere. In order to correct the situation, governing boards, and administrators must take the initiative and work together to:

- Build constituencies of support.
- Accurately define the magnitude of capital renewal and replacement needs.

- Establish procedures of institutional resource allocation.
- Gain the support of public and private sources to fund capital renewal and replacement.

If institutions are to fulfill their mission now and in the coming decades, the capital renewal and replacement dilemma must be resolved.

Appendices

Appendix A-Facilities Audit

The facilities audit, performed by in-house staff, consultants, or combinations of both, includes a physical and functional analysis of each building. The physical analysis can be done by separating the building into components of primary structure, secondary structure, service systems and safety standards. This methodology uses the following physical analysis categories:

(1) **Primary Structure**-includes the structural load-bearing elements of a building, foundations, the roofing system, and the flooring system.
(2) **Secondary Structure**-Includes architectural elements and items normally appearing in room and door schedules, interior walls, and ceilings.
(3) **Service Systems**-Includes all mechanical and electrical components, cooling, heating, plumbing, and conveying.
(4) **Safety Standards**-Includes those systems which are necessary to achieve compliance with applicable building codes, National Fire Protection Association Standards, recognized life safety practices, and Section 504 regulations.
(5) **Energy Use Efficiency**-Covers both the active and passive energy use systems of the facility.

A functional analysis examines a building's suitability of use for its present occupancy as well as for other programs, its location and other provisions. It can be used to study assignable space adaptability or suitability for present or future use. The analyses is organized so that maximum points have been assigned to 14 building components and three functional categories with a rating in relation to its contribution to the category. The maximum point value assigned to the various building components is shown in Figure A-1.

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Figure A-1

Facilities Evaluation Summary

CATEGORY	Maximum Point Value
1. Primary Structure—Foundation System	13
2. Primary Structure—Column and Exterior Wall System	13
3. Primary Structure—Floor System	7
4. Primary Structure—Roof System	7
Primary Structure Total	40
5. Secondary Structure—Ceiling System	3
6. Secondary Structure—Interior Walls and Partitions	3
7. Secondary Structure—Window System	2
8. Secondary Structure—Door System	1
Secondary Structure Total	9
9. Service Systems—Cooling	10
10. Service Systems—Heating	10
11. Service Systems—Plumbing	5
12. Service Systems—Electrical	8
13. Service Systems—Conveying	1
Service Systems Total	34
14. Safety Standards	5
Safety Standards Total	5
15. Functional Standards—Assignable Space	4
16. Functional Standards—Adaptability	4
17. Functional Standards—Suitability	4
Functional Standards Total	12
Maximum Total Points for each facility	100

Each category is inspected by the team of auditors and rated, using the classification system developed by the National Center for Education Statistics for the HIGHER EDUCATION INVENTORY AND CLASSIFICATION SURVEY. A condition value multiplier provides the subcategory value as shown in Figure A-2.

Figure A-2
Classification System

Classification	Condition Value Multiplier
(S) **Satisfactory**-Suitable for continued use with normal maintenance. No capital outlay funds needed during the next five years.	1.0
(2) **Remodeling A**-Building is currently adequate. Requiring restoration to present acceptable standards without major room use changes, alterations, or modernizations. The approximate cost of "Remodeling A" is not greater than 25 percent of the estimated replacement cost of the building.	0.8 ± .1
(3) **Remodeling B**-Requiring major updating and/or modernization. The approximate cost of "Remodeling B" is greater than 25 percent, but not greater than 50 percent of the building's replacement cost.	0.5 ± .1
(4) **Remodeling C**-Requiring major remodeling of the building. The approximate cost of "Remodeling C" is greater than 50 percent of the building's replacement cost.	0.2 ± .1
(U) **Unsatisfactory**-Structure should be demolished or abandoned because the building is unsafe or structurally unsound, irrespective of the need for the space or the availability of funds for a replacement facility.	0.0

A form combining the description of a building's characteristics, the actual rating of each system and building rating is the Physical Facilities Evaluation Summary.

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Figure A-3 Physical Facilities Evaluation Summary

Building Number and Name _____

Location _____

Survey Date _____ _____

Survey Team _____ _____

_____ _____

_____ _____

	Ratings	
	Possible	Actual
PRIMARY STRUCTURE	(40)	( )
1. Foundation System	13	_____
2. Column and Exterior Wall System	13	_____
3. Floor System	7	_____
4. Roof System	7	_____
SECONDARY STRUCTURE	(9)	
5. Ceiling System	3	_____
6. Interior Walls and Partitions	3	_____
7. Window System	2	_____
8. Door System	1	_____
SERVICE SYSTEMS	(34)	( )
9. Cooling	10	_____
10. Heating	10	_____
11. Plumbing	5	_____
12. Electrical	8	_____
13. Conveying	1	_____
SAFETY STANDARDS	(5)	( )
14. Safety Standards	5	_____
FUNCTIONAL STANDARDS	(12)	( )
15. Assignable Space	4	_____
16. Adaptability	4	_____
17. Suitability	4	_____
	TOTAL 100	

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Figure A-3 Physical Facilities Evaluation Summary

BUILDING RATING		
5. Satisfactory	95-100	_____
2. Remodeling—A	75- 94	_____
3. Remodeling—B	55- 74	_____
4. Remodeling—C	35- 54	_____
U. Demolition	0- 34	_____

_____ Building

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In the Self-Evaluation process described in the Facilities Audit Workbook is a separate form for rating each system. A typical form for a building system is shown below:

Figure A-4 Primary Structure—Foundation System

A. **SYSTEM TYPE**

(1) Exterior columns: individual ftgs. and piers _____ predrilled _____ driven piling _____ continuous ftgs. _____ caissons _____ mats _____

(2) Foundation materials: steel _____ concrete _____ wood _____ other _____ combination _____

(3) Interior footings: individual ftgs. and piers _____ piling, pile caps and piers _____

(4) Foundation walls: continuous ftgs. _____ grade beams _____

B. **SYSTEM EVALUATION**

	5	2	3	4	U	Comments
(1) Cracked Walls						
(2) Foundation settlement						
(3) Foundation deterioration						
(4) Design load						

C. **COMMENTS:** _____

D. **NUMERICAL EVALUATION** *(circle one)*

	Condition Value Multiplier
(5) Satisfactory	1.0
(2) Remodeling A—Requires restoration, cost not more than 25% of total replacement	0.8 ± .1
(3) Remodeling B—Requires major modernization, cost between 25 and 50% of total replacement	0.5 ± .1
(4) Remodeling C—Requires major remodeling, cost greater than 50% of total replacement	0.2 ± .1
(U) Demolition—System is totally unsatisfactory and cannot be remodeled—replace	0.0

E. **NUMERICAL RATING:** 13 x (D) (Condition Value Multiplier) = _____

_____ Building

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The rating for a system is determined and then multiplied by the Condition Value Multiplier. For example, on line 1 of the Facilities Evaluation Summary (Figure A-3), an evaluation of a building's foundation as "Remodeling A" would give a condition value multiplier of 0.9; this is multiplied by the maximum rating for this category (13 points) for a condition rating of 12.

Appendix B: Cost Estimates for Replacement Value

Cost estimates for priority projects identified in the facilities audit can be developed from the Facilities Evaluation Summary (See Figure B-1). This is not a substitute for a detailed project estimate based on quantities of material and labor. However, it serves as a useful tool in providing order of magnitude costs for comparing projects.

The score of total points assigned to each building evaluated in the Summary represents the percentage of replacement value. The deficit, 100 minus the score, represents the percent of current replacement cost which will be required to repair or rehabilitate the building to meet an acceptable standard of quality. Thus, the product of the deficit, as percent, multiplied by the estimated current construction cost of a new building of the same size, occupancy and function, represents the estimated construction cost of the required repair or rehabilitation.

Sources for current local costs by building type and occupancy are available from an institution's records or from published sources, such as MEANS BUILDING SYSTEMS

Figure B.1

Physical Facilities Evaluation Summary

Building Number & Name Classroom—Office Building

Location Main Campus

Survey Date

Survey Team

	Ratings	
	Possible	Actual
PRIMARY STRUCTURE	(40)	(35)
1. Foundation System	13	12
2. Column and Exterior Wall System	13	12
3. Floor System	7	6
4. Roof System	7	5

Figure B.1

Physical Facilities Evaluation Summary

SECONDARY STRUCTURE		(9)		(6)
5. Ceiling System		3		2
6. Interior Walls and Partitions		3		2
7. Window System		2		1
8. Door System		1		1
SERVICE SYSTEMS		(34)		(19)
9. Cooling		10		2
10. Heating		10		6
11. Plumbing		5		4
12. Electrical		8		6
13. Conveying		1		1
SAFETY STANDARDS		(5)		(3)
14. Safety Standards				3
FUNCTIONAL STANDARDS		(12)		(7)
15. Assignable Space		4		3
16. Adaptability		4		2
17. Suitability		4		2
	TOTAL 100			

BUILDING RATING		
5. Satisfactory	95-100	
2. Remodeling—A	75- 94	
3. Remodeling—B	55- 74	70
4. Remodeling—C	35- 54	
U. Demolition	0- 34	

GUIDE, DODGE CONSTRUCTION SYSTEM COSTS, and the BERGER BUILDING AND DESIGN COST FILE. The published sources provide summaries of unit area costs for a variety of buildings, including some specifically identified as college and university types and occupancies. Where sufficient volume of construction history exists for a campus or in a system, this data can be used as primary sources and the cost guides as secondary sources.

The procedure for cost estimating follows three steps: (1) establishing replacement costs by building type; (2) determining the percentage of building deficiencies; and (3) calculating capital renewal and replacement costs.

A summary of estimated replacement values obtained from average costs in the three referenced sources is shown below (Figure B.2). By using the gross square footage of

each building, and the square foot replacement costs for the same building type, the replacement costs of facilities at a campus can be estimated.

Figure B.2
Summary of Estimated Replacement Values of Campus Facilities Building Type

	Gross Square Foot of New Construction July 1, 1982
Administration Building	$ 88.00
Auditoriums	86.00
Dormitories	72.00
Laboratory Schools	72.00
Libraries	86.00
Offices, Classrooms	80.00
Physical Education Facilities	82.00
Science and Engineering Facility	94.00
Student Unions and Cafeterias	82.00

For example, the facilities evaluation summary for a 50,000 gross square foot classroom building in Figure B.1 shows a maximum total point score of 70. Replacement costs are obtained by using the deficiency percentage. The estimated rehabilitation cost (July 1982) for this example would be 30 percent (100-70) times the estimated cost of replacement. The estimated cost of total replacement of $80 per square foot × 50,000 square feet equals $4,000,000. Thus, the estimated cost of rehabilitation for the building is .30 × $4,000,000 = $1,200,000. Individual components rated as priority projects can be estimated in a similar manner. For example, the electrical system rating for the building illustrated in Figure B.1 shows a deficiency of two percent (maximum rating of 8 minus and actual rating of 6). The cost of improvements is = 50,000 square feet × $80 per square foot × 0.02 = $80,000.

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